MODERN TACTICS

OF THE

THREE ARMS

BY

GENERAL M.W. SMITH.

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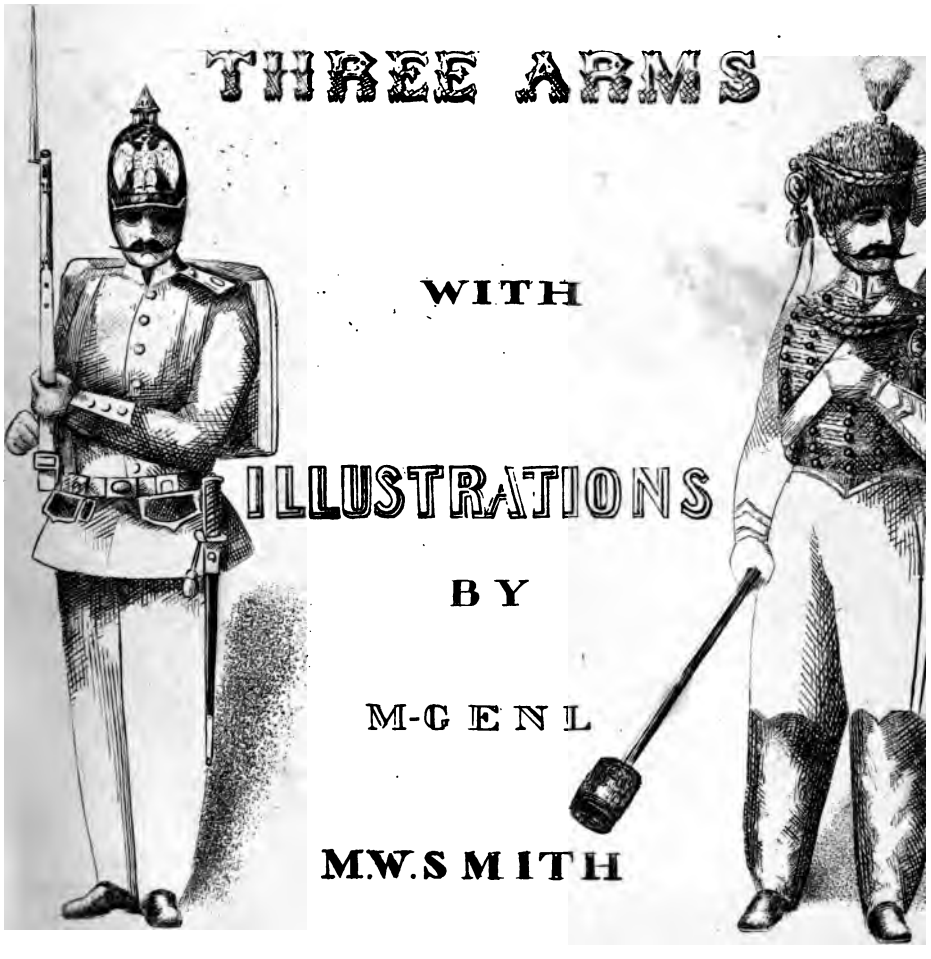

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WITH

ILLUSTRATIONS

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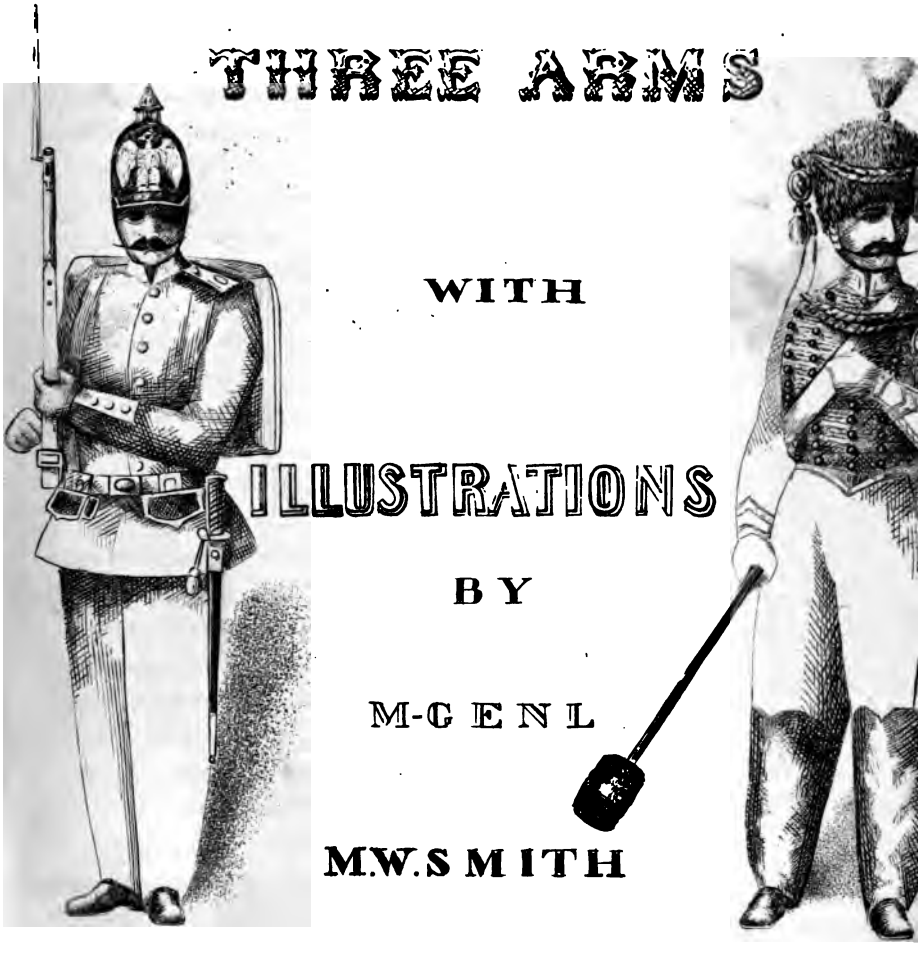

MODERN TACTICS OF THE THREE ARMS:

WITH REFERENCE

TO

RECENT IMPROVEMENTS

IN THE

ARMS OF PRECISION.

BY

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Author of "Cavalry Outpost Drill and Cavalry Skirmishing," "Manœuvres of Cavalry," &c.

WITH ILLUSTRATIONS,

DRAWN AND ENGRAVED BY THE AUTHOR.

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PREFACE.

I WAS asked in January, 1868, to deliver a lecture at the United Service Institution, on the following subject:—"Cavalry; how far its employment is affected by recent Improvements in Arms of Precision;" but I found that in the short time allotted for a lecture, I had only the opportunity of giving a very brief outline of the changes I should propose in cavalry tactics to meet the requirements of the time, and was not only obliged to leave out all details of execution, but also all the calculations upon which I had founded my reasoning and conclusions. I therefore determined to give the matter more in detail and finding. Upon considering the subject fully, that in many cases the principles I am inclined to advocate are applicable to the three arms generally, as well as to the horse artillery and cavalry, I have determined to include these cases in the present work.

Military works, in a technical form, meet with but little favour in England. To the un-military reader they must of course be altogether devoid of interest; and

although our officers, in the intervals of the time devoted to field sports and other amusements, find quite sufficient opportunity to make themselves masters of the details and duties of their profession, still, they naturally expect that their drill should be ready to their hand, and consider that the responsibility of determining whether such drill is suited to the times or not rests elsewhere, and that they are only called upon to acquire it theoretically and practically as it exists—and this is quite reasonable. It would be absurd to suppose that an officer should be expected to analyse and study the elements of the tactics of that branch of the service to which he belongs. The question therefore arises, who are to be the readers of a work like the present? The authorities who have the ruling of these matters cannot be expected to give their attention to every work which professes to propound a new theory or to advocate a change in the existing regulations, and, generally speaking, we have no readers of technical military works in England. Abroad it is different. In France, every little treatise on a military subject seems to obtain a ready sale; and in Paris, a military library, on an extensive scale (36, Rue et Passage Dauphine), is established, where military works of all kinds are to be obtained. It struck me that this may partially proceed from the very uninviting form in which these works are generally presented to the public. They seem to consist of nothing but rules, classifications and numbered paragraphs, to be referred to upon all occasions, and plans, which there is no getting at without losing your place in the text. In a

methodical work upon general tactics this exactness of arrangement may be desirable; but in merely enunciating a few propositions relating to changes in our present system, which I conceive to be demanded in consequence of the recent improvements in arms of precision. I do not feel that I need be trammelled by such observances. I have accordingly put the matter in what is commonly called a more popular form.

It appears to me, judging from the records of war in all ages, that the same means have been productive of success on the battle field throughout, namely, a superior degree of exactness and rapidity of movement, combined with a high degree of steadiness and discipline. This gives the power of concentrating troops quickly upon a given point; of turning a flank, and striking a blow unexpectedly.

The success which has attended the arms of different nations at various periods of the world appears to have been preceded by a term of preparation occupied in the training, which is to give this superiority over other nations, who rest upon the traditions of the past, and on the hope that the system, which brought victory to their standards and established their military reputation, will be found equally efficacious in the future. But while they slept, others worked, and they appear to have awoke only to find themselves defeated. This appeared to me to have been the course of events during the different changes of the world, and in order to enable the reader to judge whether I have arrived at a just conclusion, I have given

a series of slight sketches of battles fought at different periods. If I am right, one point will have been determined. What is to be done? There can be no doubt that we should utilize the time of peace at our disposal in training our troops to a system of tactics which are to give them a superiority in rapidity of movement in future wars, in addition to the pains we have already bestowed upon perfecting our armament and equipment. There remains the question, how is it to be done? I have given this subject much consideration, and it seems to me that the best way of attaining the point arrived at is to follow the course which appears to have led to success in other matters in modern times. 1st. A close attention to all details in the minutest points. 2nd. The application of a mode of calculation better suited to a subject (the elements of which are variable) and to the combined and rapid action of moving bodies than the old-fashioned and rigid system of mathematics, from which sprung what are commonly called the first principles of our present drill. But mathematical calculations, and reasoning whether the quantities are variable or constant, constitute dull matter for military readers. I have therefore attempted to give a sort of popular description of the course of reasoning employed, and a general statement of the conclusions arrived at with reference to the Appendix, where the whole will be found in detail. But there are points at which a popular and general description must fail, and where, in order to be understood, the subject must be studied. What has taken some time and labour to arrive at cannot always be

conveyed concisely in a few words. I can have no reasonable hope that any military reader will give the time and attention necessary to study the details of a system never likely to be adopted in our service; but, at the same time, I cannot propose a change in our present system without supporting the proposition by close calculation in order to show that the change is practicable. The author of a military technical work has to encounter many discouragements in this country. A scientific work is read by scientific men and is appreciated according to its merits. A military work of interest, whether historical or descriptive, is read by military men; but the technical military work is read by neither. The labour expended upon it is generally unappreciated. The question may be fairly asked, why write at all? Simply because, not many have devoted themselves to the consideration of technical subjects of this kind, and I think, in the present crisis, those who have done so ought to contribute their quota to the general fund. I am far from being obstinately attached to my own particular system. I should be very glad to see a better one proposed and adopted, or to see my own taken up, either in whole or part, by anyone who had influence, weight or power to carry it through. Other nations seem to have come to the conclusion that some change is required. Even in our own country many acknowledge that a crisis has arrived when something should be done; but if everybody remains silent, and no one proposes anything, nothing will be done.

After the delivery of my lecture at the Institution, I

heard that it was said, that I had proposed movements without saying anything about the details of execution. I have accordingly given a chapter containing a sort of drill, including the words of command, and all the details of movement of some of the manœuvres proposed. To give more would amount to writing a drill book for a system never likely to come into practical existence.

In order to render the subject I am writing upon complete and consecutive in all its parts, I have been obliged to repeat in the Appendix some matters already brought forward in former works; and with regard to the introductory chapter containing short sketches of battles fought at different times, I have introduced some battles the details of which have been often repeated, and the reader may reasonably think it rather hard that the old familiar story, the oft-told tale, to be found in every school history, should be so mercilessly inflicted upon him; but my object has been to give consecutive stories of battles of different times, so that the reader, having before him an epitome of the whole, may judge without reference to other works whether what I advance is true—that in all ages the utilization of the times of peace and leisure, and the resulting rapidity and efficiency of movement in the field, have formed the chief elements of success. If I had left a gap in the record by omitting battles which are familiar to every one, the subject would not have been complete as a whole. I know that the objections which will be made to the modifications which I propose by those who will not take the trouble to study

the matter will be to the following effect: that this sort of thing, although ingenuous in theory, is inapplicable in practice; that the whole affair is founded upon calculations of time and distance, combinations of rates and paces, &c.; and that in the hurry and excitement of action officers and men are too much occupied with other matters to carry out minute directions on these points. But any one who will study the calculations upon which I have founded my proposals will find that I have left such a wide margin in each case for error in execution, as well as casualties, that it would be impossible, even in the confusion and hurry of action, to exceed the limits assigned. I have, in some of the movements proposed, depended to a certain extent upon distances measured by mounted men, counting the strides of their horses. This is a simple matter. I have tested it over and over again during a space of many years, and always found it to be depended upon far within the limits required; but if in the excitement of action the horse is to loose the use of his legs, and the rider of his intellects, of course the principle cannot be carried out. In the infantry movements it would seem a simple matter that one man in an advancing or retiring line should be told off to count his paces, and give some signal or indication when a certain distance, become familiar and often practised, was completed. Distances to be preserved in manœuvring are laid down in our infantry regulations, and I have only suggested a modification in these distances in order to avail ourselves of the rapid action of our breech-loaders.

I don't see why, as a general rule, we are to assume that in moments of peril and danger the British soldier is to become a helpless, nerveless individual, totally incapable of any intellectual exertion, or of carrying out some simple details of combination which he has learned and frequently practised.

Our cavalry and infantry evolutions have become so familiar and habitual to us, that we forget that the details of execution were originally founded upon the rigid calculations of the old school.

The time has come when, if we wish to keep pace with our neighbours, we must introduce a little refinement of combination into many matters which formerly were supposed to work well enough in the old rough way, and as well as could be expected from a consideration of the component materials.

I have given a short chapter upon cavalry equipment. I introduced a few words on this subject into a little work on outpost duties, which I published some time ago, and was very sorry to find that the only impression I seemed to have made upon the few people who took the trouble to read it, was that I was anxious to develop and introduce into practice some absurd idea of tying a carbine to a man's right leg which had taken possession of my mind.

It has been a difficulty and a matter of discussion for a long time how the cavalry firearm should be carried. And far from taking up crude notions in the matter, and trying to carry them out, I have given the subject great

consideration, compared all the different modes of carrying the cavalry firearm, both ancient and modern, and have had greater opportunities of studying the practical working of the matter in all its different phases than most people; and I have come to the conclusion that the attachment to the waist-belt is open to fewer objections than any other mode of carrying the carbine; and what I propose, which will be found explained further on, is merely a modification of this principle. I may be quite wrong in the conclusions I have arrived at, and it will be for others more competent than I am to decide in the matter; but I merely wish to state that I have studied the subject practically and theoretically, and have not taken up any idea without a thorough investigation.

As to the question whether a cavalry man should carry firearms or not, I shall not enter into it here. They do carry firearms, and as they do so we had better find out and determine the best mode of attaching them.

Most people seem now to have adopted the idea that cavalry trained to use rifled firearms effectively on foot as well as on horseback might be made highly useful under the following circumstances.

In skirmishing and on outpost duties, or when pushed on rapidly to hold a pass, ravine, passage of a stream or river, or difficult ground over which a retreating enemy might have to pass, till the main body of the pursuing force arrived upon the scene of action, and in the retreat to perform the same duty while the retreating force found time to take up a new position, in the attack of artillery

or infantry squares, and under many other circumstances of modern warfare.

I have given illustrations of the equipment I propose, as being the best means of explaining the details. I must claim indulgence for them, as being the works of an amateur, and the first of the kind I have attempted. I might have had the illustrations designed and executed by professional artists, and by that means have embellished my work in a way now so prevalent and taking; but I thought it better to sacrifice all that kind of thing to a true and faithful illustration of the details of equipment which I meant to represent.

I have reason to believe that before long, proposals will be brought forward in consonance with the views of many in the present time, originating from the success of some operations during the American campaign to the following effect:—

That much may be done by organising a force, upon a comparatively large scale, which may be rapidly transported to a given point, and there employed to take advantage of accidents of ground, or strong position of any kind to hold temporarily in check large bodies of the enemy, till the slower movements of the supporting forces are completed.

I think there can be little doubt of the advantage to be gained if the organization could be effected; but then we have, in the first place, to contend against the old strong prejudice against mounting infantry, strengthened by experience of the past; and this prejudice is very strong

with those who cannot or will not see the almost radical change which has come upon us. There is also the question of expense, for mounting large bodies of infantry, even upon inferior horses, costs money; and then the question of what is to be done with their horses when arrived on the scene of action, or when dismounted upon any other occasion.

I feel confident that these questions will be ably dealt with; but, in the meantime, I think it might be advantageous to organize and equip a certain portion of our cavalry, who are already mounted, so as to render them serviceable under the circumstances described.

I cannot close these preliminary remarks without saying a few words upon three matters, which I think will most materially modify and influence our future field operations:—

I. The Portable Field Telegraph system now being introduced.

II. The improved system of Pontooning.

III. The introduction of the Lasso Drill into the cavalry service.

I shall follow the course which I intend to pursue as far as possible throughout this work, and give a popular description, which anyone may read and understand, in as few words as possible, of the matter, with a reference to the Appendix, where the whole will be found in detail for those who care to study it. For the details in the matter now treated of, I am indebted to Lieutenant Blood, of the Royal Engineers, who has kindly furnished me with the necessary information.

The Portable Field Telegraph may be described as follows:—

Six drums or rollers of the wire to be laid down, together with the elevating poles, earth plates, and other necessary implements, and a small hand-barrow attached, are carried upon a waggon, weighing about 30 cwt., drawn by four horses.

The instruments and batteries are carried in a covered waggon, weighing about 20 cwt., drawn by two horses. Over average ground, these waggons can proceed at the rate of five miles an hour, and while in movement at this rate, the wire is paid out.

Each drum round which the wire is coiled carries half a mile of wire (880 yards). Each waggon therefore carries three miles of wire.

At the end of each half mile, it is necessary to attach the end of the wire already paid out to the end of the next coil, and also to ascertain, by means of the earth plate and sounder, that the communication is maintained.

This can be effected in ordinary ground within two minutes, when the waggon again proceeds.

But we cannot always expect to have even tolerably level ground to move over. The ground may be intersected by small ravines or watercourses, hollow roads, or other impediments over which it will be necessary to support the wire, or one or more roads or lines of communication may be crossed where the wire must be carried over the road above the heads of the advancing troops. In order to meet this, telescopic poles, 10 feet 6 inches in

length, as they lie in the waggon, and 18 feet long when extended, are placed longitudinally in the centre of the wire waggon, as already stated, one-half of these poles have a very simple arrangement for holding and fixing the wire at one end. The wire being protected by a covering of indiarubber, insulators are unnecessary. There is also a bayonet joint to fix the poles when extended, which, when fixed in the ground, elevate the wire about 16 feet. This elevation of the wire is necessary in the cases described; but it is formed of seven strands of copper wire twisted together, covered by a coating of indiarubber, which protects the wire so thoroughly that an artillery waggon might pass over it without injuring it.

The waggons first made were badly constructed, and are in several respects ill adapted to the service; but new waggons upon a better principle are now being constructed under the superintendence of an officer of the Royal Engineers at Chatham, which, together with other important improvements are capable of turning on their own ground, carry a spare wheel in front of the waggon, and can be taken to pieces and packed flat in a wonderfully small space so as to render them capable of being stowed away on board ship, or of being carried by an elephant if used in India.

During the paying out of the wire, a quarter of an hour to each mile is a liberal allowance; therefore, taking the pace at four miles an hour, and allowing for casualties, the three miles of wire should be laid down within three-quarters of an hour. It will only take a few minutes

additional to connect the wire with the telegraph instrument contained in the office-waggon and to establish the circuit by means of the earth plates. Making every allowance for accidents, the apparatus ought to be in working order at three miles distance from the starting-point within an hour. Therefore, supposing two portable telegraphic establishments to start simultaneously from a central point in opposite directions, a communication would be established along the rear of a line of battle, six miles in extent, within one hour.

In fact, while the corps and divisions were taking up their posts along the line of battle, the communication would be established. Offsets of communication might then be laid down from the central and flank points to the different corps along the line by means of the hand-barrow attached to each wire-waggon, or by men on foot—spare drums of wire for half a mile, each weighing about 6lbs., 15ozs., sounding instruments and a small portable tent being carried for this purpose.

Under favourable circumstances, with reference to the atmosphere, state of the weather, &c., the off-set communication might be worked by means of the improved system of signals now adopted; but the objection to this is, that when the fire of artillery and small arms has commenced, the smoke and general state of the atmosphere on a field of battle might impede the view; and when the communication to be made is of any length, it may become a question whether it might not be conveyed nearly as rapidly, and more safely, from the central or flank telegraph

offices if written upon a slip of paper and carried by a mounted orderly at speed. About twenty average words can be conveyed in a minute by telegraph, and when circumstances permit, it appears to me that the wire communication over an occupied position is the surest, safest and most rapid when once established; and it also possesses the following advantage: if it should be desirable to obtain a communication at any intermediate point between the stations, this can be effected by cutting the wire and using the sounding instrument. Across rivers, broad and deep streams, arms of the sea, or obstacles of any kind, the passage of which would be difficult and tedious, or from point to point when the intervening ground is occupied by the enemy, the electric telegraphic communication becomes inapplicable; and in these cases, no doubt, the improved system of signalling now adopted will be found of great value.

The unit of field telegraph equipment will consist of 6 office and 12 wire waggons; taking the half of this unit, which consists of a central and 2 flank office waggons, with 6 wire waggons attached, packed as already described, to work with. Then upon the order for establishing the communication being given, and the flank points indicated on the map or otherwise, the flank office waggons, each accompanied by 2 wire waggons, start in opposite directions from the central point, at as rapid a rate as the nature of the ground will permit, paying out the wire during the movement, 2 wire waggons remaining with the head-quarters or central office.

The line of communication over an extent of six miles will, as already stated, be thus established over ordinary ground within the hour, and then offsets of communication to the front and flanks by wire or by signal, making use, if necessary, of the wire upon the spare flank waggons.

If it should be desirable to advance or retire the line of communication, it will be only necessary for the head-quarter's office waggon to detach the wires, and then advance or retire accompanied by the 2 wire waggons, remaining with it to the new central point, having previously signalled to the flank offices to indicate the new points to be taken up; to which points the flank offices, having also detached the wire, move as rapidly as possible.

In the meantime, the four wire waggons, first thrown out to the flanks, will dismantle their lines of wire, repack the elevating poles and other implements, and regain the head-quarters and flank offices as quickly as possible.

When arrived at the new central point, the two wire waggons remaining attached to the head-quarters can move as rapidly as possible, laying down the wire *en route*, to the new flank points, where they will find the flank offices already arrived.

It will be evident that if the new line was determined upon, the wire might be laid down previous to the movement of the office waggons, and thus the main line of communication could be rapidly changed. If it should be only necessary to advance or retire a short distance, it

might be done by attaching off-set wires at right angles to the original line to be attached to the office waggons. It will be obvious how very applicable this mode of establishing a communication would be to field operations in India, where the wire, implements, and office could be carried on elephants, capable of proceeding at a rapid pace over nearly every description of ground, setting all ordinary obstacles at defiance. But, independently of the main line and off-set communications, or previous to their establishment, the rapid establishment of an instantaneous communication over a mile, or even half a mile, with some given corps or point, may be of vital importance. For this purpose, it appears to me, that mounted detachments, properly organised and trained, carrying the drums of wire upon pack saddles, properly constructed (which they are not at present), would be found useful. I believe, also, that a little training would enable a troop of cavalry to lay down a wire rapidly and effectively, without either drums or pack saddles. For out-post purposes the other half unit of the field equipment might be brought into play; the supports might be connected together by the main line of wire with a wire from some central point to head-quarters, and by offsets to the pickets on the outer arc, and then in the daytime to the small posts by signal if necessary; signals being also established beyond the flanks.

As to the alphabet, or mode of conveying communication, whether by signal or telegraph, different systems seem to be applicable to different circumstances; but for

manœuvring purposes while coming into position, when in position, or on the actual field of battle, it seems to me that one uniform system for signals and telegraph should be adopted, and that one for which a book of reference is not required, and with which several individuals in each regiment should be practically conversant. It seems to me that the Morse Alphabet,* with well-understood abbreviations of often-recurring words, as well as words of drill, would fulfil the conditions.

It has been said that electric telegraphy cannot be made applicable to manœuvring purposes, and that visual signals alone should be used. This may be true for manœuvres of a small force, on a small scale; but for working considerable forces, on a large scale, it seems to me that electric communication would be eminently useful.

* A	– —	U	– – —
B	— – – –	V	– – – —
C	— – — –	W	– — —
D	— – –	X	— – – —
E	–	Y	— – — —
F	– – — –	Z	— — – –
G	— — –	Ch	— — — —
H	– – – –		
I	– –		*5 elements in each.*
J	– — — —	1	– — — — —
K	— – —	2	– – — — —
L	– — – –	3	– – – — —
M	— —	4	– – – – —
N	— –	5	– – – – –
O	— — —	6	— – – – –
P	– — — –	7	— — – – –
Q	— — – —	8	— — — – –
R	– — –	9	— — — — –
S	– – –	0	— — — — —
T	—		

If any one conversant with the stories of battles fought in past times will picture to themselves how many disasters might have been averted, how many brilliant successes obtained, how many deeply-laid schemes baffled, if an instantaneous communication to the different points of an occupied position or field of battle could have been obtained, they will be able to estimate the great advantage which may be gained in our future operations by the introduction of the portable field telegraph.*

Great improvements are also being introduced into our system of pontooning, which, if effectively carried out now, while we have time and opportunity, upon a tolerably liberal scale, ought to produce important results in the next campaign in which we may happen to be engaged.

It has been found that the minimum of resistance supposed to be afforded to the current by the hemispherical heads of the old Blanshard pontoons goes a very short way towards compensating other serious defects in the system.

Flat bottomed boats are now being constructed at Chatham, under the superintendence of an officer of the Royal Engineers, which combine lightness, durability and strength in a very eminent degree. A light, but from its scientific construction an exceedingly strong wooden framework, designed by Lieutenant Blood, of the Royal Engineers, is covered first by a coating of canvas; then of wood, about a quarter of an inch thick; then of cork, about

* Appendix, page 293—(Field Telegraph).

the same thickness; and finally of canvas on the sides and leather at the bottom; an additional coating of canvas is sometimes inserted between the wood and the cork; these different coatings are cemented or attached together by a species of glue, of such great tenacity that the canvas cannot be separated, by any force employed, from the wood, without tearing away the fibres of the latter with it.

The boats are 21 feet in length, 5 feet 2 inches in breadth, and only weigh 850 lbs., and give an available flotation of upwards of 5½ tons each; but the coating and frame-work are of such great strength that I have seen one of the boats battered by a large sledge hammer, in the hands of a powerful man, without producing the slightest impression.*

The carriages also for carrying the boats, chesses, baulks, anchors, cables, oars, &c., are admirably constructed. They are light, turn easily, are strong, and pack flat into a small compass. Each waggon carries 15 feet complete of bridge, or 1 pontoon with its superstructure. All the waggons and loads are perfectly identical, and the parts interchangeable.

The number of lashings which secure the boats, &c., on the carriages have been reduced from 14 to 4, proportionately shortening the time required to pack or unload. One hundred yards of bridge can be laid down, according to the new system, in probably half-an-hour (not tried yet in that way), and the bridge has been tested by crowds of unarmed

* The coating was invented by Mr. Clarkson of Stamford Street.

men, 64-pounder siege guns of 5 tons weight, complete, &c., and found to bear these weights with perfect safety.

There is another matter also which it appears to me would, if properly carried out, beneficially affect our future field operations, and that is the introduction of the lasso drill in an effective form into our cavalry service. As the matter stands at present, it is supposed to be practised, and it is so far practised as to enable inspecting officers to sign a certain return. But according to present arrangement, the lasso-tugs are attached to rings in a padded overgirth or surcingle, which renders the cavalry-man's seat on horseback so very uncomfortable, that the lasso drill is anything but popular in that branch of the service. For a long time this padded girth was considered indispensable; but Mr. Blood, of the Engineers, has discovered that the tugs may be most effectively attached, by joining the present regulation cavalry girth or any other in its usual position under the flaps by rings to a back band of raw hide passing under the seat of the saddle and over the edges of the side-boards clear of the horse's back. This would in no way interfere with the man's seat, or the packing of the saddle, and the tugs would be ready for the attachment of the traces at a moment's warning. If a certain number of men were told off and trained to the lasso service in each squadron, in the equipment which I propose, the traces might be carried behind the cantle, or hind fork of the saddle. I shall not enter more into the detail of this subject at present; but it must be evident to every one how useful the cavalry lasso might be made

in carrying off captured guns, or assisting our own artillery through swampy or accidented ground, in ascending steep slopes to elevated positions, or in moving sideways along slopes, in which case the lasso men moving on the ridge can support the gun.

It has been said that lasso draught if long continued would produce girth galls. I think that is doubtful; but we don't want it for a long continuance; we only require it for a spurt, and for a spurt I think it might be made very valuable.

I shall now conclude my preface by expressing my thanks to those kind friends in the different branches of the Service who have given me help and encouragement in bringing out this work.

MODERN TACTICS,

&c., &c.

We find in Xenophon the story of a battle fought more than two thousand years ago, given in much detail; but it is looked upon by antiquarians more as an amusing romance than a reliable authority.

Xenophon gives us full particulars as to costume, equipment, and minute matters, which seem too much elaborated to be strictly authentic; as well as reports of speeches, which, like some of the reports of our own days, were probably rather better than the originals.

I felt at first inclined to exclude the battle of Thymbria from the series of short sketches of successive battles which I am about to give, but upon second thoughts I determined upon giving the leading particulars as told by Xenophon; for even if not true in all the minute details recorded, the story will at least illustrate the popular opinion in the time of the author as to the events of the battle; and traditionary traces of the main points must have then existed which have since vanished.

The battle of Thymbria was fought in the year 548 B.C., by the forces under the command of Cyrus, the Persian, on the one side, and on the other by those of Crœsus, King of Lydia. The troops opposed to each other were as

follows: — Babylonians, 420,000, amongst whom were 120,000 Egyptians; Persians, 196,300; 300 cars, armed with scythes.

The scouts or patrols having brought information of the near approach of the enemy, Cyrus mounted on horseback, and followed by his staff and suite, who were all armed and equipped like himself, took his place in command of the army. The suite of Cyrus, according to Xenophon, were equipped as follows:—a tunic of purple, and casque of brass, a white plume, a javelin and sword. The chanfron or bridle, the poitrail or breast-plate, as well as the flank pieces of the horses and the quisarts or thigh-pieces of the riders, were also of brass. The arms of Cyrus differed in no respect from those of his immediate followers. We are not told the reason of this similarity, but the motive may have been the same as that which actuated the followers of Richard III. of England, many hundred years afterwards, to fight at the battle of Bosworth Field in the same costume as their prince. When the army had marched a distance (according to present measurement) of about twenty-one or twenty-two miles, they came within view of the enemy, Cyrus deployed in battle array. He formed his infantry only twelve deep, in order to give his line of battle as nearly as possible the same extent as that of the enemy; but in spite of this innovation upon the customs of those days, the Babylonian force outflanked the Persian line by about seven or eight hundred yards on each side. Cyrus having made his dispositions, gave the signal to attack. We are told that the men advanced with an equal pace aligning upon their standards, which were golden eagles fixed upon the end of a long spear. As soon as the two armies approached sufficiently near, clearly to see each other's formation, Crœsus perceiving that his line of battle considerably outflanked that of Cyrus, ordered the whole

line to halt. This halt was necessary to communicate to his generals and chiefs the plan of attack which he had formed. He ordered both his wings to take ground to the flanks and front, and then wheel round with respect to the main body, in the form of a gamma. The object of this manœuvre was to envelope the Persian forces and attack them both on flanks and centre. These manœuvres of the enemy were perceived by Cyrus, but he did not halt or change in any respect the order of his march till arrived within attacking distance. He then rode down the ranks of his army from right to left, inspecting their formations, giving explicit orders to his leaders, and addressing his officers and men in flattering and encouraging terms.

A leader of those days was, in truth, the soul of his army, all depended upon him for direction and guidance. Cyrus, by all accounts, was a leader, *par excellence.* Courage, judgment, intellect, the power of gaining the love and respect of his followers, all seem to have been his in the highest degree. Having given his orders, he regained his right flank from which the attack was to commence. The plan of attack was as follows. His commanders of infantry were to restrain their pace in the centre (taking the time from him), until the dispositions on the right, where the attack was to commence, were completed. The cavalry on the left were also to advance slowly and align upon the infantry. When all was ready on the right, Cyrus was to order the troops to raise the hymn of combat, which was to be taken up all along the line; this was the signal to all that the attack was about to commence.

Abradates, who commanded the chariots, was then to charge the left wing of the enemy, which, by the turning movement already described, had been completely separated from the support of the rest of the army.

Upon the attack being made, the infantry composing

the centre were to take up the *pas de charge*, and profiting by the confusion caused by the attack of the right wing, fall upon the main body.

A squadron of men mounted upon camels had been moved up to the first line on the left, and on the signal being given, the cavalry of the left wing, with the camels in front, were to advance upon the right wing of the enemy which had also been separated by the turning movement from the main body. The cavalry and infantry in the rear were to support the left attack. This well devised plan was successfully carried out.

The charge of Abradates cars, armed with long scythes, routed the left wing of the enemy before support could reach them from the main body, which was occupied with the impending attack of the Persian infantry. The cavalry of the left wing advancing with the squadron of camels, put the Babylonian cavalry of the right wing to flight; even before the two forces could come in contact, the horses, frightened by the advance of these animals in a body, broke from all restraint, got into confusion and took to flight.

The supporting troops followed in good order, and the centre of the Babylonian army was shaken by the determined attack; at this moment, Abradates, returning from the pursuit, charged the serried phalanx of Crœsus' army, carrying death and carnage in his furious course; but in the midst of this triumph one of the wheels of Abradates' car passing over the body of a dead or wounded soldier, the car was overturned, Abradates and those with him were killed, and Cyrus lost one of his best and bravest soldiers. During this conflict the Egyptians alone stood firm and repelled the attacks of the Persian troops; seizing the present opportunity they assumed the offensive, charged vigorously and bore back a great portion of the Persian forces as far as their moveable towers, where they were

checked. Cyrus, who had ascended one of these towers to reconnoitre, was prepared for this movement, and having rallied a sufficient force charged the Egyptians in rear; at this moment Cyrus' horse was killed by a wounded soldier who thrust at him as he passed, but he mounted the horse of one of his own guards, and continuing the attack, the whole of the vast Babylonian army which had so lately appeared in such force and power, were driven from the field of battle and took refuge in flight.

The Egyptians alone, forming a circle and covering themselves with their shields, stood their ground; but, after a long defence, Cyrus offered favourable terms to these brave enemies, and they capitulated. So ended the battle of Thymbria.

The battle of Arbela, or Gauganila, was fought (331 B.C.) between the Macedonian forces under Alexander the Great, and the Persians under Darius.

The Persian army, with its contingents and allied forces, amounting, as stated by some authorities, to 1,000,000 infantry, 40,000 cavalry, 200 chariots, 15 elephants, accompanied by followers of all descriptions, was encamped in the vicinity of Arbela, when reports were brought in of the arrival of the Macedonian army on the banks of the Tigris. Darius, having determined to fight, had caused a battle field to be selected adapted to the movements of the immense numbers at his disposal and to the particular arms of which his force was composed. The ground selected was about thirty miles from Arbela, in the direction of the river, on the banks of which the enemy were now encamped. It was a large level plain, between the Tigris and the mountains of Kurdistan, with hardly any undulations, and generally devoid of trees or other obstacles.

We are told, upon good authority, that, as in modern times, the ground of the field of battle is cleared for the

action of the artillery and other arms, ranges marked out, trenches and abattis prepared, communications opened, so in those times, so long passed, precautions were observed and arrangements made to facilitate the action of the arms then in use; bands of Persian workmen, under the superintendence of competent officers, were employed to level the slopes and remove all obstacles which might impede the charge of the cavalry or chariots; spikes were placed in some parts of the field, to defend the infantry and obstruct the movements of the enemy's cavalry.

Darius had attributed a former defeat to the accidented nature of the ground upon which he had engaged, and was now determined that the enormous masses of which his army was composed should have all the advantages which open ground and unobstructed action could give them.

To this ground, so carefully prepared and selected, he now determined to move the forces under his command, and there await the attack of the Macedonian army.

The baggage and treasure were left at Arbela, the order to march given, the camp broken up, and all the effective portion of Darius's army was *en route.* Five days were occupied in crossing the river Lycus, by bridges, the other difficulties of the march of thirty miles were overcome, and in due time the army arrived on the future field of battle.

In the meantime Alexander having effected the passage of the Tigris, which was left totally undefended by Darius, —as his sole anxiety was to bring the Macedonian forces to action on the open plain which he had chosen, and in the position which he had prepared—had been four days on the march since crossing the river; no news had been obtained of the actual whereabouts of the enemy, till, on the morning of the fourth day, the army having arrived within about seven miles of Gauganila, some Persian prisoners were brought in, who furnished Alexander with intelligence of the immediate vicinity of the Persian position.

Satisfying himself of the authenticity of this news, Alexander gave the order to halt, pitched his camp, which he entrenched and defended by stockades, and remained in the same locality for four days, for the purpose of resting his troops and making all necessary arrangements for further action.

After midnight of the fourth day, the Macedonian forces were again in movement, leaving the baggage, the prisoners, and the non-effectives under charge of a sufficient guard in the entrenched camp. Alexander hoped to come up with the enemy and engage by daylight on the following morning. But the night march of a force of 47,000 men, cavalry and infantry, in a strange country, even for a comparatively short distance, with all possible precautions as to guidance, arrangement, and discipline, in our own times, is more or less a matter of uncertainty, and it seems to have been no less so in the times of which we write; for when the grey light of morning began to make objects discernible, the Macedonian troops found themselves marching amongst a range of low hills which shut out the view on all sides, and without any indications whatever of the near vicinity of the enemy. A halt was ordered, patrols sent out in all directions, intelligence obtained, the right direction ascertained, the march resumed, and in a short time the leading troops reached the summit of the outer line of low hills amongst which they had been entangled. The increasing light spreading over the immense space stretching away for miles without interruption disclosed the dark dense masses of the Persian host in position, about three miles off, in the plain below. The different bodies, composed each of thousands of animals and human beings, hardly distinguishable in the uncertain morning light from the clouds of vapour and mist rising from the more marshy parts of the ground.

Alexander saw his enemy before him, within his reach, and evidently prepared to receive battle. He ordered a halt; assembled his generals round him, to discuss the expediency of engaging at once. There was a strong feeling in favour of immediate action, but Parmenio, his second in command, proposed that they should encamp where they were then halted, and before advancing further make a careful reconnoisance of the ground, in order to gain a distinct idea of the enemy's dispositions, and ascertain, as far as possible, what obstructions, artificial or otherwise, existed to the free action of the cavalry.

This suggestion was carried out. The baggage and prisoners were ordered up from the entrenched camp in the rear, and a new camp formed upon the ground where they had halted. Alexander spent the remainder of the day in reconnoitring the ground, accompanied by strong bodies of cavalry, supported by light infantry. The reconnoisance was completed uninterrupted by any action of the enemy, although they were vastly superior in cavalry to the Macedonians.

Alexander, on his return to camp, again assembled his officers; gave them some general orders and directions to be communicated to the divisions under their command. Spoke a few encouraging words, which were received with enthusiasm, and dismissed them to their evening meal.

It is said, that in the evening Parmenio, in company with some of Alexander's generals, came to his tent and proposed to make a night attack upon the Persian force.

The Persian camps were generally undefended, and their troops notoriously unmanageable at night, and subject to panic. But Alexander may have thought that, even under the most favourable circumstance, a certain degree of uncertainty is attendant upon a night attack, and that all the training and discipline of his own troops might be found insufficient to prevent some fatal mistake.

Whether such thoughts passed through his mind or not, he is reported to have said, "That he disdained to steal a victory." "That he was both willing and able to fight his enemy by daylight in the open field, and intended to do so."

We must here return to the forces of Darius, which were now posted in the positions they were intended to occupy on the field of battle.

Much had been done to render the Persian troops individually as effective as possible, and to bring the material and equipment of the army to the greatest perfection. The old javelins had been superseded by short thrusting pikes or lances, similar to those used so effectively in close combat by the Macedonian heavy cavalry; strong swords and shields for the infantry were also provided, as well as breast-plates for the cavalry. The scythed chariots of which, as already stated, 200 were attached to the army, were constructed as follows. The pole projecting in front of the horses, terminated in a sharp point; three sword blades stretched at each side from the yoke and scythes also laterally from the naves of the wheels. The elephants had been carefully trained and equipped to fill the new role they were designed to enact, and we are told that this was the first appearance of these animals on the theatre of war. The immense army now assembled together to fight a pitched battle, had been recruited in the countries between the Caspian Sea and the Persian Gulf, from Syria and Cappadocia to the mountains west of the Indus. The *élite* of the Persian forces consisted of the tribes inhabiting the plains on the eastern side of the Caspian and the valleys above Cabul, on the borders of India; they were led to the war by Bessus, the Satrap of Bactria, who had also in his train a body of mounted bowmen. There was a body of Greek mercenaries, stated at 50,000, who were considered as the only troops who were capable of encountering the Macedonian phalanx. Various other tribes and nations

followed the standard of Darius, and were now at last all marshalled in the respective positions they were intended to occupy on the field of battle. The Persians, as a rule, never encamped during the night, when within attacking distance of the enemy, the troops therefore on the present occasion were ordered to spend the night before the battle under arms in the positions in which they stood; this was a bad preparation for the coming conflict, as the men must have felt more or less harassed and unnerved, after a disturbed and sleepless night; it is recorded that Darius from the time when the rising sun revealed to him the Macedonian troops crowning the low heights which skirted the plain on which his army was assembled, showed symptoms of despondency and nervous foreboding, which caused much anxiety in the minds of those immediately about him; but now either actuated by their solicitations or by the promptings of his own heart, he roused himself to the occasion, and visited by torch light during the night the immense extent of his lines, in order to cheer his soldiers by his presence and encouraging words.

Dawn broke upon the still camp of the Macedonians, and found the soldiers refreshed with sleep and full of confidence. It is related that when Parmenio and the other generals went to Alexander's tent to receive his orders, they found him in a profound sleep; Parmenio was at last obliged to rouse him, and expressed his surprise that he should sleep so soundly at such a crisis, as if he had just gained a victory. The King replied, "to have come up with the enemy, and made him stand to fight is in our case equal to a victory."

In the first grey of the morning the Macedonian troops, cavalry and infantry, moved to their respective posts in the plain, when the two opposing forces occupied the positions indicated in the Plan.

MACEDONIANS.

First line.

I. Eight squadrons of companion cavalry, each under its separate commander, but all under the command of Philotus, the son of Parmenio.
II. The Agema, or chosen band of the Hypaspistæ.
III. The remainder of the Hypaspistæ, under Nikanor.
IV. Six divisions, composing the grand phalanx, each under its separate commander.
V. The allied Grecian cavalry.
VI. The Thessalian cavalry, under Philipas.

Second line.

VII. The Pæonian light cavalry (lancers), under Aretes and Aristo.
VIII. A body of Agrians, under Attalus.
IX. The Macedonian archers, under Brison.
X. The veteran mercenaries, under Kleander.
XI. Bodies of Thracian and allied cavalry, under their respective commanders.

In front of the first line.

XII. The Grecian cavalry, under Menidas.
XIII. A brigade of darters, under Balakrus, together with bodies of bowmen and Agrianian darters.
XIV. The Grecian cavalry, under Andromochus.

The Thracian infantry, supported by three bodies of cavalry, were left to guard the baggage.

As in two former battles, Alexander took command of the right, making over the command of the left to Parmenio.

PERSIANS.

Main line.

XV. The Bactrians, under the command of Bessus, the Satrap of Bactria.

XVI. The Dahæ and Arachoti, under Barsiantes, the Satrap of Arachosia.

XVII. The native Persians, horse and foot.

XVIII. The Kaducians and the Surians, under Oxathres.

XIX. The horse and foot guards, Karians, &c.

XX. The Albanians and the Sakasinæ.

XXI. The cavalry under Phrataphernes, composed of Parthians, Sakæ, Tapyrians, and Hyrkanians.

XXII. The Medes, under Altropates.

XXIII. The Syrian contingents, under Mazæus.

In rear of the main line.

XXIV. Babylonians, Uxians, and numerous tribes and nations, crowded together in dense masses.

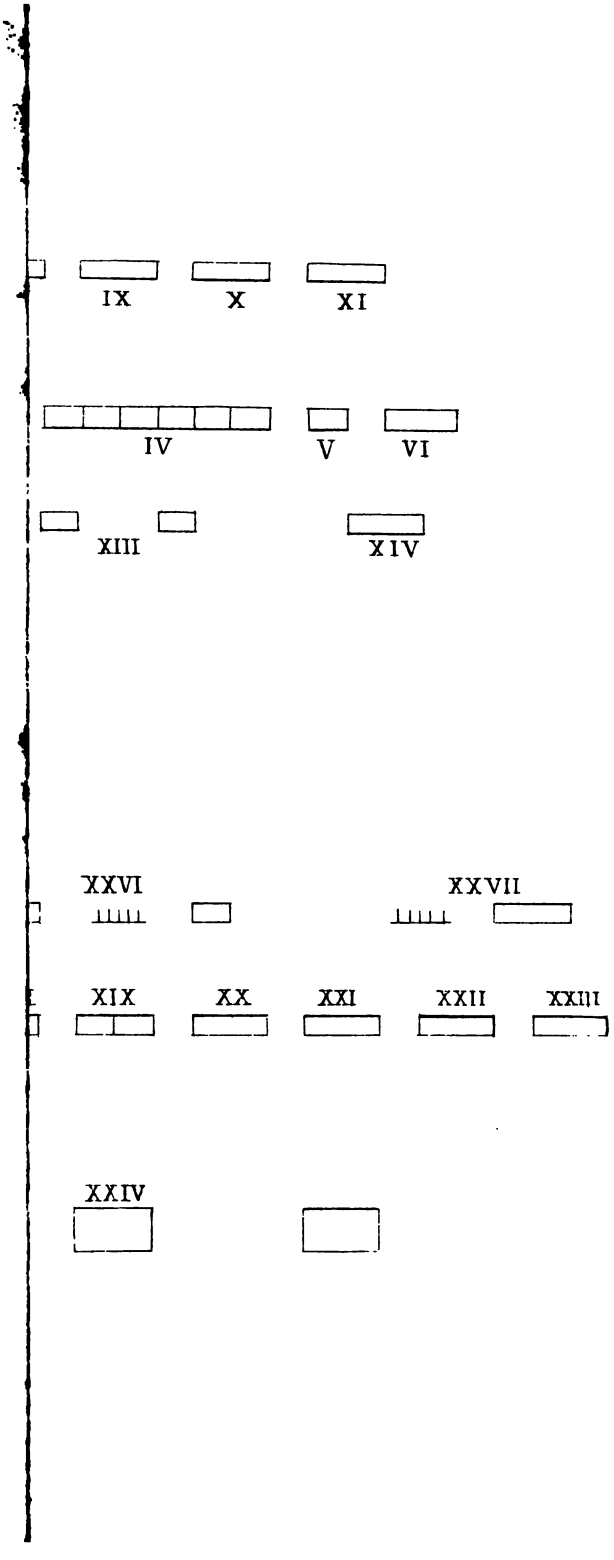
In front of the main line.

XXV. Bodies of Scythian and Bactrian cavalry, with one hundred scythed chariots.

XXVI. Fifteen elephants and fifty scythed chariots, escorted by bodies of cavalry.

XXVII. Bodies of Armenians and Cappadocians, with fifty scythed chariots.

Darius, according to custom, took post in the centre (XIX.), surrounded by his guards, a regiment of Karians, and other bodies of contingents.


IX
X
XI
IV
V
VI
XIII
XIV
XXVI
XXVII
XIX
XX
XXI
XXII
XXIII
XXIV

Alexander, placing himself at the head of the Royal or Companion squadrons on the right, gave the order to advance.

He moved obliquely to the right in an echellon formation, keeping his right advanced and his left refused; having been informed by a deserter from the Persian force as to the points where the iron spikes had been placed, he avoided them in his advance. Still gaining ground rapidly to his right, he had now got so far in that direction, that he had nearly cleared the ground in front of the left centre which had been levelled by the Persian workmen for the action of the chariots.

In order to check the further progress of this movement, the Sythian cavalry, supported by a body of 1,000 of the Bactrian horse, posted in front of the left of the Persian main line, were ordered to take ground to their own left, outflank the advancing Macedonian cavalry, and attack. Observing this movement, Alexander sent orders to Menidas, commanding the Grecian cavalry in front of the right of the first line, to advance.

The commandant of the Bactrian horse observing the advance of Menidas, relinquished the flank attack of the companion cavalry, formed, and advanced to meet the attack of the Grecians.

Here terminated the preliminary movements of the battle, and the charge of these two bodies of cavalry commenced the action.

The Grecian cavalry were in the first instance obliged to give way, and were forced back till joined by the remainder of their own force and a body of the Pæonian lancers, which moved out from the right of the second line to their support. The tide now flowed back towards the Persian line: the Bactrians, defeated in their turn, gave

way, were joined by the Sythian cavalry, and Bessus the Satrap, at the head of the main body of the Bactrians, moved out to their support, leaving the position which they had filled in the main line unoccupied. The action between the two bodies of cavalry was fiercely contested, with varied success, Greeks as well as Bactrians and Sythians suffered considerably; at last, the superior discipline and close fighting of the Macedonians prevailed. The Sythians and Bactrians were shaken, they gradually yielded, gave way, were driven upon their supports, and the whole mass was forced back beyond the main line, leaving the left centre of the Persian army exposed.

While this conflict was carried on on the left of the Persian line, Darius had given the order for the charge of his scythed chariots to be followed and supported by the general advance of his whole line. It was calculated that the terrific charge of these armed chariots would carry death and confusion into the enemy's ranks, and that the steady advance of the deep serried line in the rear would at once complete the victory.

But the charge was altogether a failure. Darius saw the hundred chariots in his own front commence their furious career, and the long extended line of his troops gradually getting into movement to support the attack—his heart must for the moment have been filled with exultation and the anticipation of an easy victory; but the scene before his eyes soon changed. The horses and drivers were wounded by the archers and darters who had been placed in front of the Macedonian line, some of the teams turned right round, refusing to face the line of pikes, or scared by the noise made by the soldiers striking their arms against their shields; some of the light troops in front caught hold of the reins, dragged down the drivers

and killed the horses; a few which reached the Macedonian line were let through by the soldiers opening out to the right and left.

From the Persian side the sound of the many wheels and the galloping of the horses were heard, as the line of chariots rushed to the front. Now, the thick clouds of dust from the sandy plain enveloped them, and then there was a pause, a confusion of sounds, a something indescribable, which, on such occasions, conveys to the minds of the listeners that something untoward has happened; and then, as if in a moment, the thick clouds of dust rising like a curtain disclosed here and there the débris of broken and disabled chariots, others flying away towards the flanks, and the remainder having been secured, or having passed through the openings of the Macedonian lines, must have appeared to the spectators amongst the Persian troops to have suddenly and inexplicably disappeared from the scene. The two lines were disclosed face to face now without any impediments between them, and nothing was heard but the tramp and confused noise of the advancing multitudes. The distances between the two forces was gradually diminishing, when Alexander gave the order to his first line, which had hitherto remained perfectly silent and immoveable, to raise the war shout and charge to the front; at the same time sending an order to Aretes, in command of the portion of the Pæonian cavalry still in the second line, to protect the right flank.

He then discontinued his own oblique movement to the right, changed the direction of his advance, and charged at the head of the companion cavalry into the opening which had been left in the Persian main line by the movement of the Bactrian troops. Having got within the line he changed front rapidly, and pushed straight

towards the position occupied by Darius and the guards. Then, if the records are to be believed, ensued a scene not unlike the charge of the heavy cavalry at Balaklava. The comparatively small body of companion cavalry led by Alexander became involved in a close hand-to-hand fight with the masses of troops which intervened between them and the point occupied by Darius; but this small body of determined men gradually worked their way through the crowded mass in which they were enveloped, thrusting with their short pikes at the faces of the Persians. We are told that the Persians in those days, as is the case with many of the Arab irregulars, and others in the present, trained to fight with missiles on horseback, circling and turning sharply to renew the attack, were completely disconcerted by this new mode of fighting. It had been found successful on former occasions, and was eminently so on the present, for the companion cavalry continued to gain ground till at last they forced their way through the opposing masses, and came in view of Darius, surrounded by his guards and all the splendour of royalty.

But in the meantime the Macedonian phalanx had advanced with their six rows of levelled sarrissæ, and their contact with the main Persian line was momentarily becoming imminent. This may partially account for the success of the companion cavalry in their flank attack; they were now face to face with the best troops of the Persian army, who surrounded their sovereign, guards, horse and foot, Karians, Greeks, and the numerous officers and attendants in the royal suite. Alexander took a moment to rally, a moment for breathing time, and then charged home into the ranks of the best troops of Persia. The conflict was desperate and obstinate, and might have been prolonged; but an event occurred which sealed the fate of

the Persian power, and from that moment the battle was lost. Darius, when he witnessed the utter failure of the charge of his chariots, lost heart, and when this was followed by the momentary stillness which generally succeeds a catastrophe, and then by the thrilling war shout of the Macedonians as they advanced to the attack, he became stunned and bewildered by the rapid change of events, over which he seemed to have lost all control; and now, when he suddenly turned his eyes from the scene acting in his front, which had hitherto engrossed all his faculties, and saw his deadly enemy almost within reach of him, and his own personal guards apparently forced back by the furious onset of the companion cavalry, it is related that he lost all nerve, and overwhelmed by a weakness which has been known in critical moments of great peril to assail even those who under more hopeful circumstances have shown courage and daring, and leads them to think that all is lost, while the stout in heart, strong in nerve, and cool in judgment, see many a chance still remaining. Darius, in the words of Ahab, King of Israel, ordered the driver of his chariot to turn his hand and bear him forth from the host. There is a story to the effect that Alexander cast a spear at Darius, and missing him slew the charioteer, when the horses being without control turned and fled; but the authority does not seem reliable, and it seems more probable that some order or indication was given which led to the King's flight from the battle, and the word once spoken there was no recal; the King's immediate followers turned with him, and others having no guidance or direction took the same course. The royal chariot was borne away with the tide of fugitives, and there was now no turning back, the irrevocable die was cast, and all was over, having by the speed of his horses got clear of the throng of battle, he mounted a fast horse, which was in

readiness for him, and while the conflict still raged on the plain he was several miles on his road to Arbela.

In the mean time the pressure of the Macedonian phalanx continued along the Persian front, forcing the advanced ranks back against the rear, the Greeks, Kasions, Guards (horse and foot), after the flight of the King, finding themselves, assailed in front and flank, gradually wavered, gave way, and at last broke. The best troops of the Persian army being thus defeated, dismay and consternation spread rapidly through the remainder of the right and centre; without guidance or a chief to fight for, the whole of the left and centre of the Persian army, so lately marshalled in the imposing array of battle, with all their gorgeous trappings, magnificent uniforms, costly arms and splendidly caparisoned horses, became a dense mass of helpless fugitives.

The Bactrians had been defeated and driven from the field by the Pæonian cavalry, leaving Alexander thus far free to follow up his brilliant success; but the masses were so driven together, the dust raised by the retreating multitude so dense, that all traces of the king's course were lost to the pursuers. Nothing could be seen in the darkness, from which issued the cries and noises of a confused and panic-stricken multitude, the tramping of horses, the rolling of wheels, and the sound of the whips of the charioteers as they urged their horses to full speed.

While these events were passing on the left of the Persian line, a different scene was being acted on the right.

Mazæus, who commanded, followed up the charge of his scythed chariots, which appear to have been more successful than in the other parts of the line, by charging the Thessalian and Grecian cavalry posted on the left of the first and second Macedonian lines, combined with a cavalry flank attack on their left. The battle here raged with

varying success, and Parmenio found himself so pressed that he sent to the king to demand reinforcements.

This message reached Alexander in the moment of his triumph and victory, and as has so often happened since on the field of battle, he was obliged to relinquish the pursuit of present success to afford his aid where it was urgently required. Time was now precious, and he passed rapidly with his force of gallant horsemen across the field of battle, which was the shortest route to his destination.

The two left divisions of the phalanx had already halted upon receiving a demand for assistance from Parmenio, leaving the other four divisions to follow the advanced movement. This left a gap in the line between the four right divisions and the two left. This was observed by the commander of the Indian and Persian cavalry in front of the right centre of the Persian line. He charged through, but his cavalry instead of joining in the attack on the Macedonian left, did not stop till they reached the camp on the neighbouring heights. The guard was unprepared, and they were at first successful, but while they were engaged plundering the baggage two of the divisions in the second line changing front came to the rescue and put them to flight. The Thessalian and Grecian cavalry seeing the success on the right rallied and charged to the front, and supported by the remainder of the left wing, bore back and routed the troops of Mazæus, fighting bravely to the last, and Parmenio was thus victorious before assistance reached him. Alexander, in passing across the battle-field, encountered some of the best of the Persian and Parthian cavalry, who were the last to retire; a close and sanguinary hand-to-hand encounter followed, and many brave men lost their lives.

Being now victorious along the whole line, Alexander resumed his pursuit of the flying enemy—there was no

hesitation, no ordering of troops to hold themselves in readiness for the pursuit, no making over of the command to another, but Alexander himself, at the head of his cavalry, supported by a strong body under Parmenio, pressed forward at once in pursuit.

Many of the flying enemy were slain or taken prisoners, particularly at the passage of the river Lykus.

The passage of this river had been more disastrous to the flying Persians than the swords of their pursuers; the bridges were soon blocked up, and the panic-struck fugitives threw themselves in despair into the rapid stream, and encumbered by their arms failed in reaching the opposite bank, and were lost.

Darius had continued his flight, escorted by the Bactrian cavalry, a portion of his guards, and accompanied by about 2,000 Greek soldiers who had joined him on the road, he took his course over the mountains towards the capital of Media by a route difficult and little frequented. Having arrived at the banks of the river Lykus, Alexander was obliged to halt to rest and refresh his exhausted men and horses. At midnight he again pushed forward with such cavalry as could follow him to Arbela, hoping there to come up with Darius. He reached Arbela in the course of the morning, and found the town undefended. Darius had merely passed through, continued his flight, and was now far ahead, his chariot, bow, shield, rich equipages, and large treasures were found abandoned in Arbela.

The Persian camp, near the field of battle, had been occupied, and the baggage, elephants, and camels captured without resistance.

The losses on the Persian side are variously stated at 300,000, 90,000, and 40,000, and on the Macedonian side at 500, 300, and 100.

The battle of Leuktra was fought in the year 371 B.C. between the Theban forces under Epaminondas, and the Spartans and Lacedæmonians under Kleombrutus.

The Theban force is stated at 6,000, and that of Kleombrutus at 11,000; whether these numbers are strictly correct or not, there is every reason to believe that the Theban force was decidedly inferior.

The two armies were encamped upon opposite heights, separated by some low ground. The officers and soldiers of Kleombrutus's force were full of confidence and eager to engage; their only anxiety was that the Thebans should not effect their escape.

Some skilful and successful strategic movements on the part of Kleombrutus, including a march over difficult mountain roads, previously deemed impracticable for troops, which placed his army within an easy march of Thebes, and opened a sure communication by sea with Sparta, had raised the hopes of his own army, and proportionately depressed and dispirited the Thebans.

They were dismayed at the sudden and unexpected appearance of the enemy, and it required all the influence of Epaminondas, assisted by the energy of Pelopidas, to induce them to march out of Thebes, and in company with the Bœotian allies, take up their present ground.

This first success of Kleombrutus was the more important, as cold heartedness, if not actual treachery, lurked amongst the allied troops attached to his army, and this is supposed to have influenced, in some degree, the fate of the future battle; he had opponents, as well as partizans, in his camp, but all were unanimous in urging him to immediate action.

At a council of war, held on the morning of the battle, it was decided to attack at once. The final orders were issued by Kleombrutus after the mid-day meal, at which it

is stated both he and his officers drank freely, and that being heated and excited they neglected precautionary measures which might have otherwise been adopted. The army marched out and formed in battle order on the lower portion of the declivity, upon which the camp was pitched.

Kleombrutus, with the Spartans and most of the Lacedæmonians, were in first line on the right, formed twelve deep; the cavalry were also in first line; the remainder of the infantry, in second line, considerably outflanking the cavalry on the left.

The Theban troops also marched out of their camp, and took up their positions as follows:—The first line was formed of the Thessalian cavalry, amongst whom were distributed some light infantry troops; in rear of the Thessalian cavalry, the Theban infantry were formed in second line, eight and twelve ranks deep; and on the left was posted the sacred battalion, under the command of Pelopidas, supported by a body of chosen Theban Hoplites, drawn up fifty ranks in depth.

Epaminondas is supposed to have been the first to introduce the oblique order of battle—that is, the attack with one flank, while the other remains refused. Knowing that Kleombrutus, with the Spartans and most of the chief officers of his army, would take post on the right of their own line, he determined to bring all the force of his attack upon that point, calculating that, if successful in defeating the best troops in the hostile line, he would thus paralyze the resistance of the remainder.

In those days, victory at the point where the chief and the best troops of the army were posted, was generally victory everywhere; and, even in former battles, this point had been strongly assailed, but it had been the custom to engage all along the line at the same time: consequently, in 371 B.C., the oblique order was a new introduction.

Epaminondas, before marching from his camp, had sent away his baggage and attendants home to Thebes, and, at the same time, made proclamation that any of his Bœotian Hoplites who did not care to support him in the ensuing fight, might also leave the camp if they wished to do so. There were many then in the Theban army who despaired of their cause, and had lost all hopes of victory. Amongst these were the Thespians, who at once availed themselves of the permission accorded, and left the camp. But when a large body, many of whom were unarmed, were observed from the enemy's side detaching themselves from the Theban main body, a considerable force, composed of the Spartan allies and a body of mercenaries, moved out to intercept them, and forced them to return.

Epaminondas's plan of battle was as follows:—To attack, with his left wing strongly supported, the right wing of the enemy, while at the same time he refused his own right. To prepare the attack, and cover his movements by a charge of the small body of cavalry at his disposal, it was thus carried out. The Thessalian cavalry advanced to the front, charged the enemy's line of cavalry, and this movement commenced the action. The Spartan cavalry were formed of untrained and inefficient soldiers, substitutes of the rich citizens, who furnished them with horses and arms, but they were without confidence and deficient in discipline. The Theban cavalry, on the contrary, were well trained and disciplined, and had gained confidence and experience in their warlike expeditions; the consequence was that their charge was successful, and they forced back the enemy's cavalry upon the second line, which they threw into disorder; at this moment the sacred battalion, supported by the Theban chosen phalanx, fifty ranks deep, advanced to the attack of the Lacedæmonian right, while the remainder of the infantry advanced

their left flank, refusing their right. The Theban forces thus took the oblique order of modern days. There are no records as to the detailed movements by means of which this plan of attack was carried out, but it is probable that it was effected by means of a direct echellon formation of some kind, for this being the simplest mode of executing it would be the most likely to be adopted in primitive times. It is said that Kleombrutus advanced his own left, while at the same time he threatened the left flank of the advancing Theban phalanx with a portion of the forces on his extreme right; but the charge of the sacred battalion, composed of men highly trained in the Palæstra, and well enured to violent and combined exertion, supported by the overpowering attack of the dense and serried phalanx on the left, broke the Lacædemonian line, and threw the whole force on their right into confusion.

Kleombrutus was mortally wounded, and it was with difficulty that he was carried off yet alive; many of his superior officers fell at the same time, and the whole of the right Spartan wing was broken, defeated, and driven back to their camp on the higher ground.

The portion of the Theban infantry which had been refused, and had not therefore been seriously engaged, were, together with the cavalry, in a position to take advantage of the confusion. The troops on the left of the Peloponnesian army, seeing the Spartans give way, and being unable to stand the attack of the fresh troops opposed to them, fell back upon their camp, which was protected by a trench, and thus the battle of Leuktra was won by a happy application of the oblique order of combat. Of 700 Spartans who had marched forth from the camp, only 300 had returned to it. 1,000 Lacedæmonians had been left upon the field. The Theban loss is stated at 300. Authorities differ as to these numbers, but what I have given seems the most probable.

About nine years afterwards the battle of Mantinea was fought between the Thebans under Epaminondas, whose forces consisted of 30,000 infantry and 3,000 cavalry, and the Peloponisians, whose force numbered 20,000 infantry and 2,000 cavalry. The Theban plan of attack was in principle the same as that adopted at Leuetra, and was on the point of being successful in execution. The principle of the oblique attack was again about to win the day, when in the moment of triumph and victory the great leader who devised it fell mortally wounded. The master hand was at once removed, and all became confusion.

The Theban cavalry on the right wing, contrary to their orders, charged the Athenian cavalry on the enemy's left, which, supported by the cavalry of reserve, drove them back. The right wing of the Thebans, which should have been held refused, became involved in the melée, and the whole fortunes of the day were changed. About this time various changes and improvements in the system of tactics were introduced; the subject seems to have been considered in a scientific form, and the movements determined upon certain defined principles. The cadence of the infantry pace was adopted by the Greeks, and later on by the Romans. The cavalry were carefully trained, and were divided into—heavy mail-clad horsemen, light cavalry armed with javelins, and a species of troops destined to fight both on foot and on horseback. The deep formation for the cavalry was abandoned, and a more extended formation adopted. Decker considers Alexander to have been the originator of field artillery, for he managed to combine the action of the machines employed for casting projectiles (which, up to his time, had only been used in sieges) with the movements of his troops on the field of battle. The phalanx still remained the formation for infantry combat, the system of defensive flanks, and

flank attack, particularly for the light cavalry, was introduced and practised.

We now come down to the time of the Romans, the best soldiers of their day, the power of whose arms and discipline gained them for so long the supremacy over the known world.

During the long Punic Wars the Roman armies had to contend against the force and discipline of their Carthagenian enemies, supported by a cavalry superior in numbers and training to their own, and commanded by some of the best leaders of those times. The Roman troops, with their perfect discipline and the spirit and confidence with which they were animated, became almost invincible under a general who knew how to use the powerful means at his disposal, but where this knowledge was wanting not even the courage and training of the Roman soldiers could compensate for the deficiency, and defeat, not victory, sometimes attended the fortunes of Rome during the second Punic War.

In the year 217 B.C., the Battle of Trebia was fought between the Romans under the Consul Sempronius, and the Carthagenians commanded by Hannibal. The Roman forces amounted to 36,000; and those of the Carthagenians to 28,000. Hannibal was aware of the impetuosity and want of judgment of the Roman general, and taking advantage of the accidents of the ground, placed 2,000 men in ambush in the vicinity of the River Trebia, under the orders of his brother Majon. He then ordered his Numedian cavalry to cross the stream at break of day, and proceeding to the verge of the Roman camp to incite the enemy to battle, then to recross the river rapidly, drawing the Romans after them in pursuit. This plan completely succeeded. Sempronius threw himself into the pursuit of the Numedians with headlong ardour.

His troops (who at that early hour had taken no food) were nearly frozen in crossing the stream, for the snow was falling heavily. He then formed up in order of battle on the other side of the Trebia. Hannibal, on this occasion, formed for the first time a portion of his force as a reserve. The Carthagenian cavalry, more numerous than the Romans, charged them and put them to flight. Hannibal attacked the enemy in front and flank; and this, combined with the attack of Majon in rear, completed the defeat of the Roman troops. The latter fought with the most heroic bravery, but in vain. The Carthagenian loss was inconsiderable, but that of the Romans is reported to have been 26,000 men.

About a century and a-half afterwards we find two great Roman commanders opposed to one another, at Pharsalia. Cæsar had not only the energy to lead but the judgment to command, and the most perfect control over his soldiers. Pompey, on the contrary, possessed so little of this influence that he was forced into accepting this battle against his convictions, by the jealousy and impetuosity of his subordinates. Cæsar's forces amounted to 80 cohorts, 22,000 infantry and 1,000 cavalry. Pompey's army consisted of 112 cohorts, 45,000 infantry and 7,000 cavalry.

Cæsar ordered up some cohorts from his third line to the support of his small body of cavalry. Addressing the veterans to whom he confided this important duty, he told them that it was upon their courage and coolness that the victory mainly depended. He ordered them, when they encountered the enemy's cavalry, to strike at the face, for he knew that the young nobles, who formed a great portion of Pompey's horsemen, would prefer flight to disfigurement. Then, placing himself in the centre of his second legion which the horsemen of Pompey's army had

boasted they would trample under foot, he gave the signal to attack. Pompey's troops remained firm in the formation which they held, and resisted the first shock of Cæsar's army, while at the same time their cavalry drove back that of the Romans, thus for the time uncovering the right flank of the Roman position; but, encountering the cohorts placed in support by Cæsar, they were in turn obliged to retreat. The slingers and archers of Pompey's army being deprived of the support of their cavalry were broken and thrown into confusion. While the first line was thus engaged, the Roman cohorts, which had encountered the enemy's cavalry, having advanced, attacked them in flank and rear. At this moment, Cæsar brought up his third line to relieve the troops of his first. These fresh soldiers, attacking the disordered forces of the enemy, carried everything before them, and the battle was won. 15,000 of Pompey's troops are reported to have been killed in the battle, and 24,000 laid down their arms. 180 standards and 9 eagles were taken. The Roman loss is stated to have been inconsiderable.

The success of the Roman arms depended mainly upon the training of their soldiers and the organisation of their forces, which enabled them to act rapidly and effectively upon decisive points, and, after the battle of Pharsalia, no new form of their system of tactics seems to have been developed. The military and maritime expeditions which succeeded, in no way illustrate the subject under consideration; and then ensued, during the long centuries of the Imperial dynasty, the dissensions and corruptions which caused its fall, and prevented the development of the military qualities which had brought Rome to the position of greatness which she held so long. With the Roman Empire ended the Roman discipline, and with it the military power founded upon combination and training,

which had ruled the world. The Roman system of tactics, successful upon so many battle fields, was also temporarily lost, only to be revived in after times. An age of darkness and confusion succeeded to that of light and order. We have records indeed of battles fought during these times, in which it is possible to trace the influence and power of the old tactical system; leaders rose up who seem to have appreciated the value and power of discipline, but the records are faint and uncertain, and there are not many leading facts to lay hold of. To write a history of the German and other battles and campaigns, would be to write a history of the nations engaged. During a space of many hundred years, little occurred which would in any way illustrate the art of war, and this brings us down to the romantic age of chivalry when tactics seem to have become extinct, when nothing was respected but personal prowess, and nothing studied but the science of personal combat; all the energies of the civilised world were devoted for the time being to bringing this system of warfare, founded alone upon superiority in the individual combat, to perfection. The mail-clad horsemen, inured to hardship and fatigue, and trained from their youth to martial and athletic exercises, full of courage and chivalrous enthusiasm, when supported in second line by their squires, formed an imposing and effective cavalry. The impetuosity of their first charge, whenever they acted together, carried everything before it, and when it was followed by the steady support of paid troops in compact bodies, the effect was generally irresistible. The mode of fighting of the middle ages will be best illustrated by an account of one or two battles fought during the crusades.

The Battle of Ascalon was fought in the year 1099, between the army of the Crusaders and the forces of the Saracens, under the Emir Afdhul. The Christians mustered

15,000 infantry and 5,000 cavalry, while the forces of the Saracens amounted to at least 40,000.

The approach of the Saracen army being reported, Godfrey, collecting all the troops at his disposal, marched by the route of Ramla to encounter the enemy on the plains of Ascalon. Having arrived near the small stream of Soree, which would afford water for his cattle and troops, he determined to halt for the night. Dividing his force into eight corps or divisions, he placed them one in rear of the other, with only a short interval between them. Thus was passed the night before the battle.

The next morning the Christian forces passed the stream and formed in battle array in two lines. The cavalry forming the first line; the right wing, under the Count of Toulouse; the centre, under the orders of Tancred, Robert of Flanders, and Robert of Normandy; Godfrey assumed command of the left wing. The Saracens were formed in line of battle as follows:—Right wing of the Saracens resting on some neighbouring heights, centre composed of *troupes d'élite* of the Egyptians, left wing resting upon the sea.

The leaders joined by their forces having offered up a prayer to God to bless and prosper their cause, Godfrey gave the order to march, and the whole Christian force advanced with perfect order and steadiness to the attack. When arrived within distance, the cavalry of the centre, under Tancred and the two Roberts, charged the centre of the enemy. Nothing could withstand the onslaught of these mail-clad horsemen. The sacred standard of Afdhul was captured, and the whole of the Saracen centre broken and driven back. This success was immediately followed by a charge of cavalry, under Godfrey, against the Saracen right wing, which was also overpowered and dispersed. Up to this time the left wing of the Saracens had stood

their ground and fought with determination, but seeing the remainder of the army broken and defeated, and finding themselves without support, they retired upon the fleet of the Egyptians.

It was during the Fourth Crusade that the battle of Ptolemais was fought, in A.D. 1189. A battle which shows how a neglect of necessary prudence and tactical arrangement by the commanders of the Christian forces led to disastrous results, when opposed to an accomplished and active leader, who knew how to take advantage of their neglect. The Crusaders were under the command of Godfrey de Lusignan, the Saracens under the Sultan Sallah-u-Deen. The forces of the Christians are generally stated at 30,000 men. The army of the Sultan is said to have amounted to 60,000. The Crusaders had been occupied with the blockade of Ptolemais from the 28th of the preceding August, when suddenly the forces of the Infidels appeared on the neighbouring heights, where they established their camp. Several engagements took place between the two forces with varied success, but on the morning of the 4th of October both armies advanced from their camps and formed in the plain in order of battle. The Crusaders had taken up their position in their usual simple way. The cavalry was in first line, and the infantry formed the second; but on this occasion the Templars were posted in reserve, and so far all was well.

The action commenced about 9 a.m. by a determined attack by the whole line of cavalry of the Crusaders. The infantry advanced steadily in support. The powerful charge of the cavalry was, as usual, for the time irresistible; but unfortunately the mistake was made which has been repeated more than once in comparatively modern battles. The Templars, carried away by the excitement and enthusiasm of the moment, broke through all restraint,

forgot the important *rôle* they had to play, and joined in the charge of the centre attack. This additional impetus bore back the whole of the Saracen centre, and threw them into confusion; but in the meantime their left wing had held their ground, and steadily resisted all the attacks made upon them.

Sallah-u-Deen made every exertion to rally and reform a portion of his routed centre; and at this moment a sortie from the garrison of Ptolemais threatened the Christian forces in rear and flank. The Templars, returning from the pursuit which they had carried too far, were attacked by Sallah-u-Deen, at the head of his rallied troops. The confusion increased in the ranks of the Christian army, which began to give way at all points, and it was with difficulty that Godfrey de Lusignan, at the head of the troops which had been left in the lines, could cover their retreat to the camp.

Notwithstanding this defeat, the Crusaders continued closely to invest Ptolemais; but the place was not taken until 1191, when Richard of England had joined the army. With the fall of Ptolemais and Jaffa, ended the Fourth Crusade. It was followed by others, during which no battles took place which appear worthy of record. So ends the long period during which the science of tactics seems to have slumbered. A new era in warfare was about to dawn.

The great importance of the invention of gunpowder does not at first appear to have been fully appreciated. Many years elapsed before men's minds became impressed with the changes to be effected in warfare by the introduction of this new and wonderful power. It was towards the end of the fourteenth century that a Swabian monk, Albrecht de Branstedt, invented a species of small arms, which he called "Hand Rohre." Pistols were invented

at Pistoya, in Italy. The musket does not appear to have been in use on the field of battle till the commencement of the sixteenth century. This new introduction was in every respect antagonistic to the customs of knighthood and the power of chivalry which had reigned paramount for so many ages. All the courage, training, and skill of the armed and mounted chevalier; all the studied and elaborate arrangements of their equipment, were of little avail against antagonists who could strike from a distance, far out of reach of the weapons at their disposal. It was impossible that the knights should all at once divest themselves of the habits of their lives, the hereditary customs and prejudices descended to them from a long line of brave and noble ancestors, and adapt themselves to a new state of things which demanded not only courage, personal training, and expertness in the use of arms, but patience and study—an exercise of powers both intellectual as well as physical—to enable them to contend in the new species of warfare with their inferiors in rank and station.

The result was, that warfare and all connected with it began to lose much of its fascination for these devoted worshippers of a bygone institution. They retired from the field; hung up their armour, as trophies of other days, in their old halls and castles; hired mercenaries to fight the battles in which they no longer cared to engage themselves; and so it was that knighthood and chivalry became a tradition.

During the middle ages the art of war (such as it was) had been almost exclusively the province of the knights and noblesse, and the military education of the lower orders seems to have been neglected; but, now that this new mode of warfare was discovered, which would place the villain or serf on an equality with his lord, the necessary knowledge was acquired with surprising rapidity.

During the Crusades mercenary soldiers had been employed. Subsequently to the introduction of firearms, these troops became much more numerous, a great number of the feudal armies disappeared, and were replaced by them. Leaders gradually sprang up (colonels), who enrolled considerable bodies of troops at their own expense, acting under any government which might require their services during a campaign. Thus originated the term "soldat," or soldier, from the word "solde" (pay). Troops seem to have been first employed on permanent pay, and a military staff first formed during the time of Charles VII. of France. In this reign carbineers were first employed. The word carbine is derived from the Arabic word kărb.

Louis XI., his successor, enrolled new troops, composed of French and Swiss, and from this time the Swiss seem to have formed a large proportion of the mercenary troops. The richest princes employed the largest bodies of mercenaries, and from this originated the saying, "Point d'argent, point de Suisses;" under the reign of Charles the VIII. Germans were enrolled in the French armies. Thus, a new order of things sprang up, and feudalism, with all its customs and impositions, vanished. The infantry was divided into battalions and afterwards into regiments. In action, the men who carried pikes were placed in the centre of masses formed of infantry, while the arquebusiers were placed in the front rank and at the angles, having fired, they fell back to the rear to re-load. In consequence of the deep masses in which the infantry were formed, they suffered much from the fire of artillery and small arms.

In order of battle the infantry was generally placed in the centre, and the cavalry on the flanks, or else amongst the infantry.

Nothing had as yet occurred to rouse the spirit of

tactics from the long slumber which the darkness of the middle ages had engendered. But, at last, one appeared who was gifted with the intellect to originate and the position and influence to carry his designs into practice.

Gustavus Adolphus appears to have been highly educated; it is stated that he studied deeply, and was familiar with the tactics of Greece and Rome, as well as with mathematical and natural science. It is said that he, like Charles V., was capable of executing topographical and other plan drawing; he also seems to have devoted himself to all the details of a soldier's profession in the minutest points, whether with reference to artillery, cavalry, or infantry. He made greater use of small arms in the field, and united with them the action of the artillery. He introduced into the Swedish field artillery, a certain degree of mobility in action, which they had not previously possessed. His field artillery was composed of 8 and 12-pounders. He introduced a kind of light artillery, which received the name of leather guns, and which acted in support of the cavalry. He broke up the large masses of the infantry into smaller bodies, and thus made them more moveable and less subject to casualties from the enemies' fire. He posted his three arms with a view to the efficiency of their action and their mutual support. He reduced the strength of the cavalry squadrons and increased their rapidity of movement. Instead of the single line formation, he disposed his forces in two lines, so that the second might support or relieve the first. He endeavoured to make up for the want of cavalry by placing infantry amongst them, and he suppressed the musket rest, which had up to that time been in use, and invented the cartouche. He adopted the system of the front rank kneeling in the infantry, and introduced what would now be called firing by divisions or companies. The infantry formed six deep, the cavalry four.

He is said to have introduced the formation in brigade copied from the Roman Legion. But the heavy artillery still remained formed in large and immoveable masses; they merely served to open a battle by a heavy cannonade at long ranges, or to repulse an attack; their part was played out when the troops advancing to the attack masked their fire. They did not accompany the troops far; they were as ill adapted for an advance as for a retreat, and generally became the prey of the victor. As to the small arms, we find it recorded: "That in an action which commenced about noon and lasted till evening, each man fired, at the least, seven times." This was considered rather fast in the days of which we are writing, which shows that the Chassepot, Schneider and Needle gun are improvements upon the firearm of that remote period. The battle of Breitenfeld, sometimes called Leipzig, was fought on the 7th September, 1631, between the Imperial troops, commanded by Tilly, and the Swedes and allies, under their King Gustavus Adolphus. The force of the Imperialists consisted of cavalry.

Cavalry.

7 regiments, under Pappenheim.
6 regiments, under Prince Furstenburg.
5 regiments, under General Isolani.
Total, 11,000 men.

Infantry.

13 terces, or brigades of infantry, 21,000 men.
Total force, 32,000 men, 36 guns.

The forces of the Swedish and allied troops were composed of—

Swedish cavalry . . .	9,000	men.
Saxon ditto . . .	4,000	„
Total .	13,000	„

Swedish infantry . .	13,000	men.
Saxon ditto . . .	11,000	„
Total .	24,000	„

Total force, 37,000 men, 100 guns.

Tilly, in command of the Imperial forces, had selected what appeared to him a strong and defensible position, in the vicinity of Leipzig, and wished, for the time, to avoid, if possible, a general action; but what occurred centuries before, when Pompey was forced by the importunity of his subordinates to give battle at Pharsalia contrary to his own convictions, occurred again in these later times. The impetuosity of Pappenheim and his supporters overcame the better judgment of Tilly, and induced him to alter his first intention, and take up a second position in the direction of the hills which ran from the village of Mahren towards Lindenthal. Here his army was drawn up in single line, as follows:—

Right Wing.

Six regiments of cavalry, under Furstenberg; in advance, five regiments of Croats, under Isolani.

Centre.

Thirteen brigades of infantry, under Tilly.

Left Wing.

Seven regiments of cavalry, under Pappenheim; twenty field-pieces, in one battery, in front of the infantry; and sixteen 24-pounders in a second battery.

The Swedish and Saxon armies, marching in two columns, approached the Lober, a streamlet which ran

along the front of Tilly's position. This stream was to be crossed by the allied army, and, to oppose the passage, Pappenheim advanced at the head of 2,000 cuirassiers, having received orders from Tilly to confine himself to a temporary opposition to the passage of the stream, without acting so persistently as to bring on a general action; but, in disobedience to this order, he attacked the Swedish advance guard, and, after a brief struggle, was driven to retreat. The passage of the stream being effected without further opposition, the allied army formed in line of battle, thus:—

Right Wing.

Five regiments of cavalry, under Gustavus Adolphus.

Centre.

Four brigades of infantry, under General Teufel.

Left Wing.

Six regiments of cavalry, interspersed with infantry, under General Horne.

Second Line—Right Wing.

Four regiments of cavalry, interspersed with infantry, under General Banner.

Centre.

Three brigades of infantry, under General Hepburne.

Left Wing.

Three regiments of cavalry, under Colonel Hall, behind the centre of the second line; the reserve composed of cavalry and infantry.

On the extreme left the Saxon army, in two lines; infantry, in six brigades; cavalry, on the wings.

Pappenheim's attack of the advance guard, the crossing of the stream by the Swedish forces, and the subsequent formation in battle array, as described, occupied some time, and it was noon before the battle actually commenced by a general cannonade along the whole line, which lasted for nearly two hours. The wind blew thick clouds of dust and smoke into the faces of the Swedes. This obliged a slight change of position of the whole force, but the troops were so well in hand that it produced no confusion, and the enemy were too slow to take advantage of the opportunity.

Tilly at last determined to descend from the heights which he held, and engage the Swedish forces. The attack opened with an assault by Pappenheim, at the head of his squadrons, upon the right wing of the Swedish army. The Imperial cavalry followed their impetuous leader to the attack, but the Swedish musketeers stood firm, and no impression could be made upon them. Seven times the attack was renewed, but still without success. The Swedes had taken the formation called *en potence*, and, favoured by the ground, held their position.

In the meantime, Tilly, advancing at the head of the infantry, attacked the centre and left wing of the Swedish line; but the well-trained Swedish troops stood firm—the discipline, brought to perfection by the personal exertion and extraordinary energy of their prince, sustained them in those trying moments. The attack failed, and the Imperial troops fell back.

An attack of the Imperial cavalry of the right wing upon the Saxon position followed, and this time the Imperialists were successful, the Saxons were thrown into confusion and driven back; and then ensued one of those critical moments in which the respective capabilities of the leaders and troops engaged are severely tried.

In this case the good leading of the commanders and training of the soldiers lay on the side of the allies. Count Horne, reinforced by three regiments detached to his assistance by the King, formed *en potence*, taking advantage of a large fosse or ditch to cover his position, while most of Tilly's cavalry were carried away in pursuit of the routed Saxons. Tilly formed his infantry in four large brigades, and supported the cavalry attack upon the left wing of the Swedes, now formed by Horne's troops, reinforced by the regiments detached under Hepburne. But the movements of the Imperial army were slow; those of the well-trained Swedes were rapid, and Tilly found, like many others, that he was a little too late. Horne and Hepburne's troops were firmly posted before the arrival of the infantry columns, and resisted all the charges of the cuirassiers and the attacks of the Imperial infantry. Tilly was wounded; and Horne bringing his squadrons, interspersed with bodies of musketeers, into action, attacked in turn. The cuirassiers were taken in flank and forced back; the infantry began to waver.

The left wing of the Imperial army having been broken and driven from the field, the troops on the Swedish right, under the immediate command of the King, were now free to turn their arms in any direction; the King changing front quickly to his left, attacked the heights upon which the Imperial artillery remained posted, on a line nearly at right angles to his former line of movement. They were carried at the first assault, and the whole mass of immoveable artillery fell into the hands of the Swedes.

The battle was lost, and the only remaining resource open to Tilly was a rapid retreat, and even that was attended with great difficulties on account of the new position assumed by the enemy's force, but the determined courage of the Austrians, conspicuous upon so many battle

fields, since supported them even in this disastrous crisis. Five regiments of walloon cavalry steadily and bravely covered the retreat, as far as the protection of a wood, situated in rear of the first Imperial position. The captured guns were turned upon the retreating army, till at last the darkness of night fell upon both forces and put an end to the conflict.

Of the Imperialists, 7,000 were killed and 5,000 wounded or taken prisoners. The whole of their artillery and camp fell into the hands of the allies.

The Saxons lost 2,000 men, and the Swedes 1,000.

At the battle of Lutzen, in 1632, Gustavus disposed his troops in the same manner as at Leipzig. The army being formed in two lines, and small squadrons of horse interspersed among the infantry, while troops of musqueteers were placed among the cavalry. It was at this battle that Gustavus lost his life. At Lutzen the artillery of the Imperialists was united into one great battery; that of the Swedes was distributed along the front—five heavy field pieces being placed in front of each of the four foot brigades, besides forty light pieces in the first division.

For more than a hundred years after the death of Gustavus, although many battles were fought, and many distinguished generals gained lasting reputations as accomplished leaders and gallant soldiers, no great improvements or radical changes seem to have taken place in tactics; on the contrary, the science seems rather to have retrograded during that period, although it was to a certain extent the age of small improvements in equipment and detail. The musket came more and more into use as the infantry arm and the pike was almost entirely abandoned; but this change, though it increased the efficiency of the infantry in some respects, greatly weakened their power of defence against the attack of cavalry, for in those days there was

no bayonet or sword attached to the barrel of the musket, which would make the weapon available either as a fire-arm or a pike. To meet this difficulty, small hand pikes (Epien) were adopted; each soldier carried one, but this necessarily greatly impeded the free movements of the infantry. The bayonet had been invented, but was so badly constructed that it was necessary to unfix it when firing. Hand grenades came into general use about this time, whole battalions were trained to use this weapon, and were called grenadiers. But about the middle of the eighteenth century the weapon fell into disuse, and the name of grenadier only remained.

The general use of artillery and small arms necessarily involved the reduction of the depth of ranks for two reasons. First, the greater the depth of ranks the less the extent of fire of the small arms; and secondly, the less the depth the less the chance of casualties from the artillery fire of the enemy. The infantry was at first formed six ranks deep, subsequently it was found necessary to increase the extent of front of the troops in position in order to avoid being outflanked, or else to gain the advantage of outflanking the enemy; this led to the adoption of the formation in three ranks. Towards the commencement of the eighteenth century the importance of greater exactness and rapidity in evolutions began gradually to be appreciated. The formations in squares to resist cavalry came into regular use. The order of battle was generally in three lines, and a reserve; distance between lines from 300 to 500 yards. The formation was sometimes by alternate squadrons, orhataillons, which facilitated the passage of lines. The attack was generally made by a simultaneous advance of the whole line, therefore the attacking force became engaged at all points at the same time. Any application of the principle of retaining one

portion of a force while the other was reinforced for the attack, or any adoption of the oblique order of battle or echellon formation seems to have been very rare. On the march the different arms moved in separate and distinct columns; this greatly interfered with their reciprocation and rapid combination at the commencement of an action. Decker mentions that in consequence of this system at the Battle of Steinkerken (1676) the Dutch artillery did not arrive at the field of battle until after the defeat of the army. During the years just preceding the reign of Frederick the Great, the importance of mathematical exactness in military manœuvres seems to have been fully understood; calculations with reference to time and space were applied to field movements, the length and cadence of the infantry pace was closely studied, men were trained to march to music; this is a powerful auxiliary which has not, I think, been so much employed as it might. Parade movements are indeed performed to music, but beyond that its power does not seem to have been taken advantage of. My experience has led me to think that in music we have a means of impressing upon the soldier the rythm or time of pace, and by this means obtaining the rate or velocity so valuable in all combined movements. Even as regards cavalry I feel convinced that bands playing while the horses are exercised in the different paces would have a salutary effect. It is a mode of teaching the man and horse together, which is better and quicker than the time keeper and the measured distance.

The discovery had been made that mathematical precision, as well as calculations as to time and space, might be advantageously applied to movements in the field. Frederick William, father of Frederick the Great, had sufficient intellect to seize upon the letter, without being able to appreciate the spirit of this new doctrine; and hav-

ing done so, he had the obstinacy and indomitable determination to carry into execution the idea which had taken possession of his mind. Hence originated the rigid discipline, the studied exactness in all the minutest details, which reached a degree of perfection well known to all military readers. Things were in this state when Frederick the Great assumed the reins of power. Of him, it may be said, that of all men who played a prominent part in the world's history, he had the merit "de reconnaitre sou siécle." He thoroughly appreciated the requirements of the age in which he lived, and had judgment enough to utilise the means at his disposal as far as they were applicable. He had the genius to seize upon the spirit of the new doctrine, as well as the persistence—which probably was hereditary—to carry it into execution. He felt that, although the extreme rigidity and exactness of minute details which had been insisted upon amounted to an absurdity, still, under the outer coating of pedantry and formalism, there existed a germ of power which might be turned to account, and render his troops superior in manœuvring capacity to all whom they might encounter. He did all that was possible in those days to improve the construction of the fire-arm which he placed in his infantry soldier's hands; and he instituted a manual and platoon exercise, to render him expert in the use of his weapon. He concluded that, although the martinet system of drill and training to which the army had been subjected might be modified and turned to account in the movements of the infantry, it was altogether inapplicable to the cavalry. He therefore adopted a totally new system for this arm of the service.

Finding that in consequence of the slowness and difficulty of loading, and the faulty construction of the fire-arms of his day, it was a totally inefficient weapon in the hands of

a mounted man, he abolished the fire-arm in the cavalry, and substituted the "arme blanche." He also introduced rapidity of movement into all their evolutions, and in general infused a spirit into his cavalry which has lasted up to the present day. The result was, that these troops led by Seidlitz, Zeithen, and others, opened to him the road to victory, supported him in moments of danger, often turned the tide of the battle, and covered the retreat in case of disaster. He also modified his artillery, and made it more capable of movement. He not only attended to the squadron and battalion drill in all its departments, but he instituted camps of exercise, at Potsdam, for practice of movements upon a large scale, to which officers came from all quarters for instruction. The Prussian troops under Frederick were so well drilled, they moved with such steadiness, and were so accustomed to formations in large masses that they were capable of marching in open columns of small frontage corresponding to the lines of battle, and when arrived on the ground they were to occupy, forming in battle array in a few seconds by a simple wheel into line. The artillery of those days was too immoveable and inefficient, and the cavalry too slow, to interfere with this mode of formation. It was by a simple movement of this kind that Frederick brought his army into position previous to the Battle of Zorndorf. When formed, the troops were disposed in the following manner:—The right flank of the infantry at about 700 or 800 yards from the village of Wilkersdorf; this space was occupied by Norman's dragoons in 1st line, and Reusch hussars in second line. The infantry line extended to a point in rear of the village of Zorndorf. Two regiments of hussars and eight regiments of cuirassiers were in 1st line on the left, supported by some regiments of dragoons in second line. Eight battalions, composing the advanced guard, were about 150 yards in

front of the left, with a battery of 12-pounders in each flank. Ninety-one guns were in position all along the line, in addition to the battalion guns. The depositions were completed about 9 a.m.

The advanced guard having received the order to march, moved in two bodies, one on the right, the other on the left of Zorndorf; the batteries being placed in position on the small hills in front of that village, opened fire, which was replied to by a much heavier cannonade from the Russian batteries. Both lines of the left wing of the infantry moved in support of the advanced guard; the cavalry on the left deployed into one line extending beyond the village of Zorndorf, under a heavy fire, and with the exception of two regiments which were detached to the right alligned with the first line of the infantry.

The orders for the advance given by the King were these—The left of the first line of infantry were to keep at a distance of 250 yards in rear of the advanced guard, the right wing was to remain refused and out of range of the enemy's batteries.

The first line of the left wing had to pass partially in column round the right of the village of Zorndorf, and it would therefore require a reformation, and consequently a temporary halt of the advancing line, to place them again in the position with relation to the advanced guard, ordered by the King. But the advanced guard continued its onward march without giving time for this movement, and thus became separated from the support of the infantry. This was the more unfortunate, as the cavalry on the left, having suffered from the heavy fire of the Russian batteries, and having been consequently thrown into some confusion, were checked in their advance, and were also separated from the advanced guard. To make matters worse, the left of the latter had so far out-marched the right

that when arrived within musketry range of the enemy the front of the force took a position oblique to their line of movement, and when under fire, in consequence of the left of the advanced guard still further accelerating their pace, the left flank became exposed to the attack of the enemy. This mistake would not have been so serious if support had been within reach; but as it was, the Russian cavalry seeing the intervals which separated the advanced guard from the cavalry and the left wing of the infantry, charged them in flank, and forced them back as far as the village of Zorndorf. Seeing this success, the Russian General, Fermor, ordered his infantry to pursue the retreating Prussians. The infantry rushed forward with wild shouts, but before they had advanced more than a hundred yards or so they got out of hand and lost their formation; and at this moment, the succour so much needed by the Prussians, was at hand. As soon as Seidlitz observed that the advanced guard had given way, although the ground was unfavourable for cavalry, he advanced with his squadrons to the rescue. The hussars and the cuirassiers charged the Russian cavalry, who gave way before the impetuous and well-trained Prussian horsemen, while at the same time the gens-d'armes and the gardes de corps fell upon their disordered infantry, which the cuirassiers and hussars (having disposed of the Russian cavalry) also charged in flank. At this moment the King gave the order for the right wing to attack to the front. These troops having strictly adhered to their orders, had only advanced a very short distance from their first position. A battery of artillery, escorted by a battalion detached from the right of the second line, was placed in position on some high ground in advance of the extreme right. In the meantime the right wing continued to advance slowly and steadily till arrived in line with the left wing, which, having re-

covered from its disorder, had reformed, and the whole of the Prussian infantry advanced in line. But at this time a charge of Russian cavalry was made upon the detached battery and its escort on the right, which was successful. Another charge of the Russian cavalry was made upon the left flank of the first battalion of the regiment (Prince of Prussia), but the Prussian infantry throwing back their left division received the cavalry with a musketry discharge at fifty-one yards and drove them back. At this time the Prussian cavalry charged that of the Russians in possession of the battery, retook it, and drove the enemy's cavalry back upon some marshes in the vicinity of the position.

The right wing of the infantry continued to advance steadily, but the Russians having rallied made a combined attack of cavalry and infantry upon the left wing, which, whether from some moral effect produced by their first repulse, or from some other unaccountable cause, again gave way. But the indefatigable squadrons of Zeithen and Seidlitz came once more to the rescue, filled up the interval left by the broken left wing, and charging the Russian cavalry, drove them back upon the marshes of Quartschen. The right wing of the Prussian infantry, attacking the Russians in flank, drove them upon a portion of Seidlitz's cavalry not engaged in the pursuit. Seidlitz changing front rapidly to the right charged the Russian troops, who still held their formation, under a heavy fire from the enemy's batteries, which were still served. At this point a fierce fight ensued; in the mellée the firing ceased on both sides, and the troops of both nations fought with sabre, bayonet, and even the butts of the muskets. The disorder seemed for a time to reign equally in both armies; but out of this chaos and dreadful carnage, the splendid training and instinctive discipline of the Prussian troops rose victorious, and after a desperate resistance, the

Russians were compelled to give way. On account of the approach of night, Frederick was not anxious to pursue his success farther; hearing, however, that a portion of the enemy's force had rallied, he ordered the right wing to attack them in front, while the left took them in flank.

But the Prussians being without the support of their artillery, and their ammunition failing, were unable to carry out their instructions, and the Russians continued their retreat without further obstructions.

The Russian loss was 18,000, killed and wounded, and 2,800 prisoners.

The Prussians lost 10,000, killed and wounded, and 1,500 prisoners.

About this time another battle was fought, in which all the generalship of the great Frederick, the training of his troops and the impetuous charges of his splendid cavalry could scarcely ward off the disastrous effects of a neglect of watchfulness and precaution. Those who have been on service will recollect how little attention is paid to anything which is of daily recurrence, or any sight or sound which may have become habitual. The firing during a siege becomes so much a matter of course, that it is scarcely heard. Skirmishing of constant occurrence in any particular quarter attracts little notice from those who are not engaged; but this sort of apathy may sometimes prove dangerous, as was illustrated by the battle of Hohenkirch.

For some days the right of the Prussian army had been disturbed by the Croat skirmishers, who regularly, about four or five o'clock in the morning, fired upon them from some woods and underwood in the neighbourhood, and so little mischief was done, that the Prussian soldiers paid little attention to it; this was subsequently taken advantage of to cover the first movements of a decisive battle. The roads and paths through the underwood were carefully

surveyed by the Austrian engineers, all obstacles to the march of troops were removed, marks of direction were placed at different points, and all this was done with the greatest caution. One evening, after sunset, the Austrian army, moving by several columns, arrived at the points assigned to them. The tents were left pitched, and a few men remained in camp to keep up the fires. All was executed in complete silence. All the corps intended for the attack arrived at their destinations during the night, without attracting attention. On the morning of the 15th, at five o'clock, the usual firing was heard from the woods in the vicinity of the Prussian right flank, but no more than the ordinary attention was paid to it. At last, becoming continuous, three battalions of grenadiers rushed, half-dressed, out of their tents, fell in, and marched in the direction of the firing. As so often happens on these occasions, the fog was so dense that it was impossible to distinguish anything at the shortest distance. Their ranks were scarcely formed, when they found themselves attacked on all sides, and were forced to cut their way, sword in hand, through the surrounding bodies of the enemy. Many were killed and many wounded. The battalion Beckendorf was charged in the retreat by some squadrons of the corps de Leudon, and suffered most severely. Even the hussars of Zeithen and the dragoons of Zetteritz were taken by surprise, and barely managed to retire in good order, till it became more possible to distinguish the state of affairs. Thus began the Battle of Hohenkirch. All that steadiness and courage under trying circumstances could effect to retrieve matters was done. The hussars of Zeithen, the dragoons of Zetteritz, Schœneich's cuirassiers, Norman's dragoons, made brilliant charges, and, for the time, carried all before them; but in vain, for the enemy, having completely succeeded in gaining the rear of the Prussian

position, new regiments of cavalry constantly arriving, while the Prussians were engaged, charged them in flank and forced them to relinquish their advantages. Much was done to retrieve the fatal mistake of want of precaution, but the first advantage gained by the Austrains continued to tell. At last the fog cleared off, and the battle ended by the king withdrawing his forces in good order.

All that was good in the tactics of the Seven Years' War, and a good deal that was bad, seems to have descended to us in the present day. The great exactness of movement and accuracy of formation, valuable, although clogged with a certain amount of pedantry, and a stiffness introduced and elaborated by Frederick William of Prussia. The rapid movement and quick formation of the cavalry, accompanied by the exclusive use of the "arme blanche," introduced by Frederick the Great, and which, under Seidlitz, ensured the victory or turned the tide in more than one battle, seems to have come down to us as a sort of venerated tradition, which it would be almost sacrilege to disregard, in spite of the changes and improvements which the lapse of years has brought about. Hence, our tenacious adherence to the system of pivots, and our horror at the idea of a mounted man making use of his firearms. But during the times immediately succeeding the Seven Years' War, although Frederick, who formed and trained the Prussian cavalry, and the brave officers who led them to victory, were no more, still, a germ of the old spirit remained; and, in spite of a system of promotion in the higher grades, bad in any service but ruinous in cavalry, this arm retained a certain portion of their rapidity and effectiveness, even when the cavalry of other nations had deteriorated and become almost useless, to such a degree that Napoleon, in 1796, sent his cavalry to the rear to be re-organized.

During the wars of Frederick the Great's time, we find a large proportion of artillery with reference to the number of troops engaged. The position artillery was only employed to fire from commanding points to prepare or repulse the attack, but the element of mobility was wanting, and there appears to have been no attempt to form a special reserve.

The Prussian regimental artillery was formed of batteries of 3-pounders. They were dragged by the men at a distance of fifty yards from the battalions, and came into action at from five hundred to three hundred and fifty paces. It is recorded that a small body of horse artillery, with gunners mounted, were employed as early as 1675. Horse artillery was employed by Frederick the Great in 1758, but it only obtained to its full importance in Prussia forty years later, in 1809, under Prince Auguste.

Horse artillery on the Prussian model was introduced into the French army during the augmentation in 1794. Battalion pieces were abolished, and divisional batteries introduced in their stead. These arrangements were afterwards adopted by other nations, and became, to a certain extent, the groundwork of modern artillery tactics. The infantry tactics of the Seven Years' War also remained in vogue till the French revolution, which shook to its foundation many a long-established ordinance and traditionary observance, and produced a radical change. This was not, in the first instance, brought about by the genius or exertions of one of those individuals, who seemed, up to that time, to have appeared periodically in the world, and caused a revolution in the art of war; it sprung from the necessities of the time. The national convention made no excuses for their generals. Victory was to be gained by them with the means at their disposal, and the penalty of failure was generally death. Multitudes of untrained re-

cruits flocked to the frontiers to join the army and fill up the ranks; but there was no time for drill and preparation. Under these circumstances a new system was forced into existence; any mode of fighting which tended to victory was considered legitimate. The old system of lines and carefully combined movements requiring much training, and practice was no longer applicable to the new state of things, the necessity of substituting some others became pressingly evident, and accordingly the French national spirit, worked up into a state of fever by the excitement of the time, which led each recruit to seek the opportunity of distinguishing himself individually, and of fighting independently, was taken advantage of. The order of fighting "en tirailleurs" and in column gave this opportunity:—

In the first, each individual might distinguish himself by personal activity, expertness in the use of his arm, and aptitude in taking advantage of ground, without having been subjected to long and systematic training.

In the second, the recruit, if successful in obtaining a place in the foremost ranks, had the opportunity of personal destruction before the eyes of his comrades, and most likely of companions of his young days before he became a soldier, who would report his courage and gallant bearing to the small circle at home.

The formation in large divisions of all arms sprung of necessity from the cordan system, since so reprobated, and so little in consonance with true principles—so far, the changes in tactics had their origin in the exigencies of the time. But it required the powerful genius of Napoleon to form these crude elements into a system which should supersede all those of former times, and enable him to lead his troops from victory to victory.

Having obtained the power which enabled him to carry his vast designs into execution, the new mode of tactics was

perfected in the camps of exercise, formed at Boulogne during 1804 and 1805. Large separate bodies of cavalry were formed to act independently, armies were divided into *corps d'armées*, which were again subdivided into divisions composed of the three arms.

Strong reserves of all arms were also formed. Strong supports were added to the Tirailleur formation, and, what at first was merely a mode of fighting, adopted from necessity, was formed into a perfect system. These changes and modifications in the art of war were subsequently more or less adopted by other nations, some having learned their value in passing through a painful ordeal. How Napoleon worked his system, will be shewn in the following slight sketch of the Battle of Austerlitz, and in the minute records of his campaigns, to be found in the authors who have written on the subject.

Just previous to the Battle of Austerlitz the situation of Napoleon's army would to any one less fertile in resources and less confident in his own power have appeared fraught with many difficulties. The Czar had arrived in person to join the Russian army; the Archduke Charles was advancing from Italy, the Hungarians were arming *en masse*, and a declaration of war from Prussia was imminent. The long line of operations from the Rhine to Vienna was to be guarded, leaving only about 65,000 men available for action. Napoleon's head quarters were at Schoenbrunn, near Vienna, where, although enormous contributions were levied upon the inhabitants, the discipline amongst the French troops was so strict that no excesses were committed by the soldiers. Negotiations were at this time being carried on between Napoleon and the Emperor Alexander; but judging from the information received from spies and other indications that the reinforcements had arrived or were about to arrive at Olmutz, and

that the negotiations were only a *ruse de guerre* to lull his vigilance, Napoleon gave the order to the army to retire, and took up a position near Brunn, at which place he fixed his own head quarters. He commenced fortifying this new position, placing his guns in battery, and made every demonstration which might lead his opponents to conclude that he had given up all idea of offensive action, and was unprepared to fight. He sent his Aid-de-Camp, General Savary, to the head quarters of the Emperor of Russia, now at Vischau, with complimentary messages, which led to Dalgorowki, the A. D. C. to the Russian Emperor visiting the French camp. The reports which he made of what he saw, as well as the accounts brought in by an officer sent with a flag of truce, and whom Napoleon is said to have met in person at the outposts, led the allies to conclude that the French forces were half beaten, and that Napoleon was only anxious to avoid a battle.

The allied armies occupied a strong position not far from Olmutz, where they were to have awaited reinforcements before making any offensive movement. The Russian Councils, which were for an immediate assumption of the offensive, overruled the more prudent advice of the Austrian Generals who had made compaigns against Napoleon, and had experience of his wonderful talent and infinite resources. The retrograde movement of the French army upon Brunn led the allies to conclude that it was Napoleon's intention either to evacuate that place without a battle, or else to accept battle in the plain between Turas and Latein. The general plan of attack resolved upon was the following:—To turn the right wing of the French, and at the same time to refuse the right wing of the allied army. It was hoped that by this means the victory would be rendered complete, and that the

French army would be forced back upon the mountains of Bohemia, and their line of operations against Vienna would be cut. This being the general plan the details were thus carried out. On the 1st of December, 1805, the allied army advanced in five parallel columns, and having driven in the French outposts took up the following positions:—

The first column—strength, twenty-four Russian battalions—commanded by General Doctorow, took possession of Anjesd, and was posted in two lines on the neighbouring heights.

The second column — strength, sixteen Russian battalions and two squadrons—under the orders of General Langerou, took up a position in two lines to the right of the first column, occupying Pratzen by their light troops.

The third column—strength, eighteen Russian battalions and two squadrons—under the command of Prince Przybyszensky, deployed in one line along the heights to the right of Pratzen.

The fourth column—strength, twelve Russian battalions and two squadrons—under General Miloradowitseh; and fifteen Austrian battalions, under Kollourath, were posted in two lines in rear of the third column.

The fifth column—sixty-two squadrons commanded by Prince Lechtenstein.

The Russian guards — ten battalions and eighteen squadrons—under the Grand Duke Constantine, took up a position on the heights near Austerlitz.

The advance guard of the left wing—strength, five battalions and thirty-three squadrons—under General Kienmaier, took up a position in front of Anjesd.

The advance guard of the right wing—fifteen battalions and forty-six squadrons—under Prince Bagration, took post between Hollubitz and Rowalobitz.

On the evening of the 1st, the Emperor Napoleon, from

the heights on which his bivouac was situated, saw the Russian forces making their dispositions to turn his right flank. All was proceeding as he had calculated in his own mind that it should. That one false movement made by his opponents, all the others became certainties. All the advantages to be gained, all the difficulties to be avoided, must have been calculated and pre-arranged in that wonderful mind. He must have felt that, with the well-tried and disciplined troops at his disposal, who had stood by him in many a trying crisis, and who were devoted to him to the death, everything possible might be dared and attempted. The great anxiety of his mind must have been as to whether the allied forces would take the course he wished to lead them to, and fall into the trap he had laid for them; and when he at last saw the heads of their columns appearing in the direction of Tellnitz and Sokolnitz, and realised the fact that all was going as he desired, we can fancy the triumphant exultation with which he exclaimed,—"Avant demain au soir cette armée est à moi."

Napoleon never seems to have spared himself any personal exertion or neglected any means to the great ends he had in view, and accordingly he next visited the bivouacs of his soldiers to ascertain by a personal inspection that all was going well and preparing for the morning's work. He had not gone far before his incognito was lost and his presence detected.

Then followed what must have been an exciting scene. The soldiers threw straw upon the bivouac fires, some lighted flambeaux, and an illumination was almost instantaneously produced. They flocked round their Emperor, and swore that the morrow, which was the anniversary of his coronation, should be celebrated by the victory of Austerlitz. Napoleon then returned to his bivouac, consisting of a small straw hut which had been constructed

for him by the grenadiers of the guard. It is said that, on entering it, he exclaimed, "Vailà la plus belle soirée de ma vie." All was confidence in the French army; but assurance of success also pervaded the army of the allies; the only fear seems to have been that the enemy would escape them. They approached close to the French outposts, and parties of cavalry patrolled along the front of the position. Everything was done by the French to increase this confidence. Murat ordered a body of cavalry to advance into the plain, and upon coming within view of the enemy's position to make a precipitate retreat.

Napoleon's plan of attack was as follows:—To retain the left wing of the allies with a proportionately small body, until he had time to bring an overpowering force into action on the centre, which he intended to force, and this he knew would be facilitated by the conformation of the ground; also to hold the right of the allies in check till his design was so far carried out that he could turn his attention to that quarter. The details were thus executed. Davoust was to be detached to the right with one division (Friaut), and one division of cavalry (Bourcier), to retain the left wing of the allies.

Of the remainder of the French army he gave the command of the right to Marshal Soult, of the centre to Bernadotte, and of the left to Lannes. The cavalry massed in one large body he placed under the command of Murat. Marshal Lannes was to take up a position resting upon the Santon (a hill near the left), which had been fortified, and upon which were placed eighteen guns. Of Lannes' *corps d'armée* the division Suchet was on the left, and the division Cafarelli on the right, in communication with the cavalry of Murat, which was formed of hussars and chasseurs, under Kellermann, and the division of dragoons (Valther and Beaumont), and in reserve the divisions of

cuirassiers (Nansouty and Hautpoult) with 24 light artillery guns.

Of the centre *corps d'armée* under Bernadotte, the left division (Rivaud) was in communication with the right of Murat's cavalry, and the division (Drouet) was on the right. The division Vandamme was on the left of the centre. Of Marshal Soult's *corps d'armée* the division St. Hilaire was in the centre, and the division (Legrand) on the right. On the left of Legrand was the detached division under Marshal Davoust, who (as already stated) had with him the division Friant and the cavalry division of Bourcier. The other divison (Gudin) of Davoust's *corps d'armée* had been detached to Nicolsberg to hold in check any attempt on the part of the enemy to turn the extreme right. The Emperor himself, with his staff, ten battalions of the guard, ten battalions of grenadiers, and 40 guns, formed the reserve.

The dispositions of the allies on the morning of the 2nd of December were made under the erroneous supposition that the French army was about to take up a position, the left resting on the heights to the left of the road to Olmutz, and the right upon the sheets of water near Kobelnitz and Sokolnitz, and under this supposition they took up the following positions :—

Prince Bagration retained his position on the right. Prince Lichtenstein covered with his corps the ground between the King and Girzikownitz. The first column was to proceed from Anjesd to Tellnitz. The second was to force the passage between Tellnitz and Sokolnitz. The third was to pass in front of the Chateau of Sokolnitz. The fourth was to pass through the defile of Pontowitz. Kienmaier, commanding the advanced guard of the left wing, received orders to send patrols to his front. The columns were to march from the positions which they occupied on the night

of the 1st to those just indicated at 7 a.m. on the morning of the 2nd. The orders for the march were that each of the three columns on the left, upon clearing the defile through which they had to pass, were to await the appearance of the heads of the other columns before continuing the forward movement. Subsequently the whole advance was to align by the left. During the early morning of the 2nd of December a thick mist hung over the defiles and valleys, which obscured the view, and prevented the opposing forces from seeing each other even when arrived within range.

The attack of the allies commenced on their left by Keinmaier marching with the advanced guard of that wing from Anjesd against Tellnitz, and the adjoining heights which were occupied by four battalions of the division (Legrand) of Soult's *corps d'armée.* This position was obstinately defended for more than an hour, until the head of the first column appearing near Aujesd, the French fell back and took up a second position some distance to the rear of Tellnitz. But the first column, instead of at once pursuing the advantage thus gained, halted according to the orders received, and awaited the appearance of the head of the second column. Marshal Davoust hearing the firing in the direction of Tellnitz sent Legrand strong reinforcements, which enabled him to take the offensive, attack, and recover his first position. A heavy fire was then opened on both sides; but, after repeated attacks the French were obliged to abandon Tellnitz for the second time and retire upon Sokolnitz. The first column having passed through the defile of Tellnitz formed on the other side in order of battle. In the mean time Langerou had descended with the second column in the direction of Sokolnitz. The French held this position with great determination for some time, but were at last obliged to give way before superior

numbers and abandon it to the enemy. The second column of the allies then deployed beyond the village. At this time the head of the third column appeared near the Chateau of Sokolnitz. The column had been thrown into some confusion on the march by the French skirmishers posted on their right in the direction of Kobelnitz, and arrived in considerable disorder on the heights near the chateau, where they halted.

After the retreat of the French from Tellnitz and Sokolnitz, the whole of the allied left wing formed up in position; but, before matters had come to this point, the sun had risen brilliantly, the clouds of mist had passed away, and the whole field of battle and the contending armies were disclosed to view. About an hour before dawn, the Emperor Napoleon had mounted on horseback, in order to visit his outposts, to reconnoitre the bivouac fires of the enemy, and to receive the reports of his patrols.

Towards 9 a.m., seeing the three columns of the allies entangled in the defiles near Tellnitz and Sokolnitz, Napoleon gave the order to attack.

The French army, then breaking into columns, advanced across the stream in front of the position.

The attack of the heights of Pratzen, which was to form the key of the position, was confided to Soult.

At the sight of this sudden movement, followed by the rapid advance of the French army, leaving no time for alteration of plan or transmission of orders, the allied columns seemed for the time paralyzed and incapable of action. The execution of the orders issued under a particular supposition were not applicable under a different state of things. The French army was not in the position which the allies had supposed it to occupy; and, therefore, all the preconcerted arrangements fell to the ground.

The Emperor of Russia, and the commander-in-chief,

Kutusow, were marching at the head of the fourth column, and had arrived upon the ground which the third column had just quitted, when they came suddenly in view of the quick and steady advance of the French columns beyond Pratzen. Kutusow, having recovered from the first surprise, saw at once the immense importance of the heights of Pratzen, and determined to make every effort to gain the position; but it was too late. Unity of purpose and rapidity of movement were on one side, hesitation and change of purpose on the other; and the usual results followed.

The first attack of the advanced guard of the allies was repulsed, and, after a hard struggle, Soult remained in possession of the heights, the key of the whole position, and deployed his forces. Then followed a desperate and general attack with the bayonet by the whole of the available troops of the allies; but this also failed against the steady and well-directed fire from the French lines. The allies were driven back with the loss of a considerable portion of their artillery, which, in consequence of the heaviness of the ground, could not be brought off.

An attack, led by Miloradowitch, of the Russian infantry of the fourth column, against the second division (Drouet) of Bernadotte's corps, was also unsuccessful. The French had now got their artillery into position on the heights, and opened a heavy fire upon the allied forces, which were compelled to fall back and yield the position to their adversaries. The contest for the possession of the heights of Pratzen lasted about two hours.

While these important events were passing at the centre, Prince Lechtenstein (on the right of the allies), who was to have occupied, with the fifth column, the ground between Krug and Blasowitz, was delayed in marching to his post, leaving the interval he should have

occupied open to a French force, consisting of one division of Lannes' corps (Cafarelli), a division of Bernadotte's corps (Renaud), and Murat's cavalry, to advance until they found themselves confronted by the reserve of the Russian guard, under the Grand Duke Constantine. The Prince Lechtenstein, finding himself in presence of the French troops, determined upon an immediate attack, and gave the order to deploy. In the meantime, the Grand Duke Constantine's regiment of lancers, which had been leading the column, formed and charged through the first line of the French cavalry, and were approaching the second, when their gallant leader fell; and, being exposed to the fire of the French divisions (Renaud and Cafarelli), they were thrown into confusion, and obliged to retire.

The French divisions, in spite of the heavy fire of the Russian guns, continued to force their way forward in the direction of the high ground between Blasowitz and Pratzen, and by this time the French batteries having been got into position on the heights of Pratzen, opened fire upon Lechtenstein's force, which having been also turned by Drouet's division, was forced to retreat through the defile situated near Krzenowitz. Constantine still continued to hold his position near Blasowitz, but Napoleon ordered the cavalry of the Imperial guard to advance and attack. The brilliant charge which followed was successful. The Russian troops were forced back and thrown into disorder, and the Grand Duke was obliged to withdraw his force by the route previously taken by Prince Lechtenstein. From the heights of Austerlitz the Emperors of Austria and Russia were witnesses of the defeat of the Russian guards; but they also witnessed the gallant action of their cavalry, which, forming up to protect the retreat of the infantry, charged the French cavalry, under Rapp and Murat, with such impetuosity, that the pursuit

was effectually checked, and the guards continued their retreat without further molestation, and united with the *débris* of the fourth column near Mazan. Thus the Emperor Napoleon's plan of forcing the centre of the allied position between Angesel and Krug was completely successful.

The force of Prince Bagration, on the right of the allied position, had up to this time only to sustain partial attacks from the enemy's forces, combined with a fire of artillery from distant positions, but now, charged by the whole cavalry force under Murat, and taken in flank by the divisions of Suchet and Cafarelli, he was obliged to give way and retire by the route of Brenowitz; a part of his force, which had been detached, was cut off by this movement. The French pursuing slowly on their left flank, Bagration's column was enabled to retire in comparatively good order.

The three allied columns on the left, which were at first successful in their advance, still occupied their position near Tellnitz, but the French having succeeded in gaining and holding the heights of Pratzen, now advanced in several columns upon Sokolnitz. A regiment of grenadiers (Kurskoi) were overpowered by numbers before support could reach them, and were made prisoners. Another regiment (Podolski), which had been sent to their support, after an obstinate resistance were driven back upon the chateau of Sokolnitz. This action, taking place to the right rear of the position occupied by the second and third columns, produced much confusion and unsteadiness in the ranks.

The division of Davoust's corps (Friaut), which up to this time had been acting on the defensive only, in order to carry out the Emperor's intention of retaining the left of the allies, now took the offensive, and attacked in front. Just at this moment, a French battery, which had

been got into position upon the high ground near the Chateau of Sokolnitz, opened fire upon the allied troops in flank and rear, and, at the same time, the division St. Hilaire of Soult's corps was seen descending from the heights in the direction of Sokolnitz. Attacked in front, flank, and rear, the confusion in the allied ranks increased beyond control. The first and a part of the second column made a precipitate and disorderly retreat upon Anjezd. The remainder of the second and the third column turned in the direction of the Lake of Kobelnitz; but a heavy fire of grape from the French batteries was opened upon them. Many were drowned in the lake, and the remainder, after a vain attempt to keep their formation and continue their march, were obliged to lay down their arms.

The first column rallied, and made an attempt to march in support of the fourth column by Anjezd; but they were too late. Napoleon had already occupied the ground near Pratzen with the reserve, and a division of Soult's corps (Vandame) descending from the heights, occupied the village of Anjezd at the moment that the advanced guard of the first column arrived before it. The column then turned in the direction of Olmutz; but the French batteries were so placed that they opened a murderous fire upon them. The battalions were broken, and the column continued the retreat in disorder, abandoning the whole of their artillery.

Doctorow, finding one line of retreat still left open to him by the French, reformed the *débris* of his force, and retired from the field, a Russian regiment covering the retreat by a desperate resistance. The bivouacs of the French army on the evening of this eventful day were formed in the positions occupied during the day by the allied army. A valley separated the two, and we can imagine the different

feelings which affected the soldiers and officers of the two armies as they sat by their bivouac-fires. The increased confidence of the French soldiers in their chief, and the triumphant feeling in the heart of that chief; pride in the art which he had brought to such perfection, in the leaders who could carry out his designs, and in the gallant army devoted to him, which, on one part of the battle-field, could act on the defensive with a skill and obstinate perseverance which set overpowering numbers at defiance,—and on the other, with the *élan* and impetuosity which renders the French soldier so formidable in the attack. On the other side of that valley there must have been a feeling that they had been overmatched by discipline and rapidity of movement, under the control of a master hand; but there must have been many a story told over those bivouac fires of brave, gallant, and devoted actions of corps and individuals during that day of carnage and disaster, and many a gallant attempt to redeem by devotion and desperate courage the fatal mistakes which led to the defeat of the allied forces. At last, night and sleep, induced by the anxieties and fatigues of the day, fell upon the survivors of both armies. The Austrians had 5,900 killed, wounded, and taken prisoners; the Russians, 21,000 men. Eighty pieces of cannon fell into the hands of the French. The French loss is estimated at not less than 9,000 killed and wounded.

So far I have given a short sketch of a battle here and there, fought at different periods, and commencing at a very early date; as I conceived that by so doing I should put the matter in a continuous form, which would enable the reader to consider the subject in one view, instead of having to seek out detailed accounts of various authors in different languages, and thus form a judgment for himself as to what were the general principles which, during the

long lapse of years treated of, produced success, and when departed from, failure. How the various changes were brought about in the different ages of the world, and in what consisted the wonderful influences which at different epochs gave to the arms of some particular nation the supremacy over the rest of the world; and, having made this analysis, to decide what are the best means to adopt to meet the present crisis—for that one of these critical epochs has arisen when a change in the art of war has become imperative, everyone seems to admit.

But we have now arrived at a period when a continuation of the illustrative sketches I have given would be unnecessary. The histories of the battles of the Peninsula, Crimea, and Indian Mutinies, in all their details, are familiar to the general as well as the military reader. We have arrived at what may be called our own times, as well as the times of "our own correspondent." It is open to everyone to read the records of modern battles in which our own troops have been engaged, which possess the credibility attached to the accounts of an eye-witness, and are at the same time embellished by an eloquence of language seldom surpassed. But it is in my opinion difficult for obvious reasons to enter upon an unbiassed criticism of the wars of our own days. I shall conclude my series of short rough sketches by the accounts of two modern battles which are of recent date, were fought by foreign troops on both sides, and having been taken chiefly from foreign sources, may not therefore be so familiar to English readers as those to which I have just alluded. The battle of Solferino was fought June 24th, 1859.

The Austrian army having crossed the Mincio on the evening of the 23rd, formed on the right bank of the river, and at dawn on the 24th occupied the following positions:—On the right, the eighth corps (Benedek), reinforced

by the brigade Reichlin, encamped close to Pozzolengo, covered by the outposts at Casa Tapaglia and at the farm of Ponticello on the Lugano Road. The fifth corps (Stadion) was established at Solferino; about the centre of the position it was united with the eighth corps by the brigades Gaäl and Kollor, belonging to the first and second divisions of the fifth corps, which were encamped at Monte Croce and the farm of Possessione, throwing out a detachment to Madonna della Scoperta.

The first corps (Clam Gallas) was formed in second line at San Cassiano and Cavriana, supported in rear by the seventh corps (Zobel) at Foresto, and by the cavalry of reserve (Mensdorf) at Bregnedolo. The Comte Stadion covered his front in the direction of Castiglione by the brigade Bils, which occupied the villages of Barche di, Castiglione, and Le Grole, pushing forward an advanced guard as far as the hamlet of La Fontane, about 1,500 yards from the suburbs of Castiglione. These corps forming the second army under Count Schlick (general of cavalry) were, in addition, covered by a line of advanced posts, extending from La Fontane to Casa Tapaglia at Le Grole, Barche di, Castiglione, Madonna della Scoperta, Contrada, Mescolara, and Ponticello. On the left flank, the third and ninth corps formed from the first army were posted near Guidizolo à Cheval, upon the high road to Mantua, supported in second line by the eleventh corps at Castel Grimaldo. General Count Wimpffen, in command of this army, had detached a battalion of the brigade Blumencron (division Grenneville, ninth corps), supported in rear by a battalion of the brigade Hartung (division Habermann, third corps) to his front as far as Casa Morino, not far from Mount Medolano, and had also occupied the little town of Medole by two battalions of infantry and some squadrons of cavalry supported by artillery.

The cavalry division of Count Zedwitz was posted to the east of the town in support of the troops which occupied it. On the extreme left, the division Jellachich (second corps) under the personal orders of the commandant of the corps (Lichtenstein), had marched from Mantua to Marcara and Mosio, in order to take part in the operations of the main army and act upon the right flank of the allies beyond Castel Goffredo. The head-quarters of the Emperor of Austria had been moved from Vallegio to Cavriana.

The allied army in accordance with orders issued by the Emperor Napoleon, quitted their bivouacs between 2 and 3 a.m., and advanced in four columns to gain the positions which they were appointed to occupy; their advanced guards and patrols driving in the advanced posts of the enemy.

The three divisions composing the fourth corps (Niel), marched from their encampment at 3 a.m., and took the road from Carpenedolo to Medole; each division advanced in fighting order *(l'ordre de combat)*, the artillery of reserve was placed between the second and third divisions. The division (Luzy) which formed the head of the column was preceded by two squadrons of the 10th chasseurs, under the orders of General de Rochefort. About a mile from Medole, near the farm of Rescia, the squadrons of the advanced guard encountered some of the enemy's light cavalry and drove them in, till they were arrested by the infantry and artillery in occupation of the town. Marshal Niel then ordered Luzy to attack and take possession of the town. The cavalry divisions, Partonneaux and Desvaux (of the first and third *corps d'armées*, temporarily under the orders of Marshal Niel), marched at 3 a.m. from Carpenedolo upon Guidizolo, they gained the old road to Mantua by taking a cross road. Their orders were, in

the event of encountering the enemy in force, to check their march so as to advance in alignment with the infantry.

The third corps (Canrobert), marched from Mezzane at 2.30 a.m., and passed the Chiese by a bridge constructed by the engineers during the night, opposite to Visano, under the protection of the brigade Jannin (division Renault). These three divisions, at an hour's distance, followed the same order of route and marched upon Medole by Aguapedda and Castel Goffredo.

The second corps (MacMahon) marched from Castiglione upon Cavriana, left in front, at 3 a.m.

The whole *corps d'armée* which moved upon the Mantua road was formed in a single column, in order to avoid any interference with the first and fourth corps, which were marching on the flanks. At about 4 a.m., the column having marched a little more than three miles, General Villaine, who commanded the advanced guard, sent back to report that the Casa Morino in front was occupied by the enemy. Shortly afterwards, the skirmishers on both sides were engaged, and the Duke de Magenta galloped to some rising ground near the road to reconnoitre the dispositions and force of the enemy.

The first *corps d'armée* (Baraguay d'Hilliers) had received orders to march on the left of the second corps from Essenta upon Solferino. The movement was effected as follows: At day-break, the second division (de Ladmirault), with two divisions of artillery, fell in, and were the first to march, taking the road which leads by the heights to Solferino. About 6 a.m. the division arrived in the valley of Padercini, from which the enemy were seen crowning the ridges of the low hills which stretch from thence in the direction of Solferino. Ladmirault formed his division in three columns, giving the command

of the right to General Douay, and of the left to General de Negrier. He assumed the command of the artillery and centre himself. The plan of attack was as follows: The two first columns were to turn the position by both flanks, while the reserve supported the movement and attacked in front. The first division (Forey) marched at 4 a.m. from Essenta, and passing through Castiglione, took the road which follows the foot of the heights by La Fontane and Le Grole. Having received reports from his advanced guard that the hills on the left of the route were occupied by the enemy's skirmishers, the General covered his left flank by four companies in skirmishing order supported by a battalion. He then continued his march, while his flanking parties drove in the enemy from the heights and the village of Fontane. The march of the third division (Bazaine) in due time followed that of the first.

The Commandant of the fifth Austrian corps (Stadion), which, as already stated, was posted about Solferino, having received reports of the advance of the French columns, ordered his troops to fall in, threw out his skirmishers on the hills in his front, and employed one brigade in covering the small hills in front of Solferino. The Austrian skirmishers, attacked by Forey's flankers and Ladmirault's skirmishers, fell back upon some supporting battalions which occupied Le Grole and the neighbouring heights.

On the 23rd the Sardinian troops were established on the left of the French army, in the following positions: The second division (Fanti) communicating with the first French *corps d'armée*, occupied Malaco and the hills Semino and Negrolo. The first division (Durando), and the fifth (Cucchiari) were encamped near Lonato, and the third division (Mollard) at Rivoltella and Mount Cavaga. The first, third, and fifth divisions had received orders

from the King of Sardinia to explore the country about Pozzolengo, by strong reconnoitring parties.

The advanced guard of the third French corps arrived about 9 a.m. in sight of Castel Goffredo. Having received reports to the effect that the town, which is surrounded by an old wall, was occupied by the enemy's cavalry, Marshal Canrobert ordered Renault to advance and take possession of the place. The General sent one battalion to the left, ordered Jannin to turn the town by the south with another battalion, while with a third, followed in reserve by the whole of another regiment, he advanced himself to the attack in front. The gate was broken open with hatchets, and the enemy evacuated the town, leaving some prisoners. Canrobert hearing firing of artillery in the direction of Medole, ordered Gen. Renault to abandon Castel Goffredo, and marched at once by cross roads as rapidly as possible upon Medole, which was at that moment being attacked by the first division (Luzy) of the fourth *corps d'armée.*

Luzy having received orders from Marshal Niel to attack Medole, made the following dispositions. He sent two battalions to the right, covered by skirmishers, and two battalions to the left in the same order, at the same time opening fire with the divisional batteries upon the place. While these movements were being effected, and when the General considered that the fire of the artillery had produced sufficient effect, he ordered the charge to be sounded, and attacking with the remainder of his division carried the place after a determined resistance on the part of the enemy.

The Austrian ninth corps (Schaffgotsche) having quitted their position of bivouac near Guidizolo, occupied with two divisions the environs of that village; one brigade was posted on the Ceresara road; Rebecco was

occupied by another, and a third was retained as a support to the other two. Four battalions were deployed on each side of the Mantua road, and the farm of Casa Nuova was strongly occupied. The left flank was supported by artillery. These dispositions being completed, the general in command hastened to support his advanced guard, and engage Marshal Niel's forces, about to deploy upon the plain of Medole.

To return to the movements of the second French *corps d'armée*, it will be recollected that upon the skirmishers being engaged in front of Casa Morino, the Duke of Magenta had ridden to some rising ground near the line of route to reconnoitre the dispositions and numbers of the enemy. On one side he saw numerous columns about to deploy on the plain, and, looking in the other direction, he became sensible of the difficulties to which the first *corps d'armée* was exposed.

He saw at once how necessary his support had become in that direction, but at the same time how impossible it was at that moment to afford such support effectively without leaving an interval between his own corps and the fourth corps (Niel's), through which the enemy might penetrate the French line of attack.

He, therefore, held his ground, deploying his second division (Deceau) on the right and left of the road; and at the same time sent to Marshal Niel to inform him of the state of matters, and to intimate to him his intention of moving to the left in support of the first *corps d'armée*. Marshal Niel replied that as soon as the capture of Medole was effected, he would be prepared to support the right of the second *corps d'armée*, and thus enable the Duke of Magenta to carry out his intention, but that he could not put this movement into execution until his own right was covered, by effecting a junction with the third

corps d'armée. Just at this moment the cavalry divisions, Partonneaux and Desvaux, arriving on the plain, were ordered to form in the interval between Niel and the Duke of Magenta's corps.

To return to the first *corps d'armée.* The flankers of Forey's division having driven in the enemy's skirmishers from the hamlet of Fontana and the neighbouring heights, the division continued the march upon Le Grole, which was strongly occupied by a brigade of the Austrian fifth corps (Stadion). Le Grole was attacked, but the resistance was so obstinate that Forey found it necessary to reinforce the attacking party before the village was taken; the troops which held it fell back upon their reserves at Mont Finele. Mont Finele was in turn attacked and carried, and was immediately occupied by a French battery, in order to reply to the Austrian artillery in position near the outskirts of Solferino. In the meantime the second division (Ladmirault), being formed in three columns, continued to advance, driving in successively the detached posts of the Austrian brigade opposed to them.

On the Austrian side Count Schlick in command of the second army seeing that the brigades in front of Solferino were constantly augmenting, put the first Austrian corps (Clam Gallas) and the seventh corps (Zobel) in movement to act in support; in the meantime the cavalry division of reserve (Mensdorf), having moved from Bregnedolo, formed upon the open ground between Casa Morino and San Cassiano.

Passing over to the Sardinian army we find the strong reconnoitring parties which, as already mentioned, were sent out, seriously engaged with the enemy in the directions of Madonna della Scoperta and Pozzolengo. It became necessary in consequence to move up troops at once from the main body to their support. One party, unsuc-

cessful in an attack upon Madonna della Scoperta, found themselves suddenly taken in flank by the head of an Austrian column moving up on the right, and were forced to fall back at once upon the supports. Durando, from Mount Tiracollo—a high point of ground which he had taken advantage of to reconnoitre—hearing on one side the firing from San Martino, and on the other from a point between Castiglione and Solferino came to the conclusion that a general action was impending, and sending orders to his troops to concentrate as quickly as possible at Venzago, he galloped in that direction himself. In the meantime, the reconnoitring party from the fifth division (Cucchiari) had encountered the skirmishers of the eighth Austrian corps (Benedek) upon the heights near the farm of Ponticello. Colonel Cadorna, who commanded the reconnoitring party, in order to form a judgment as to the numbers in his front, deployed his small force, placed his artillery across the road, and sending back to Cucchiari to request him to move on as rapidly as possible to his support, opened fire upon the enemy. At this moment, General Mollard, who had himself accompanied the reconnoitring parties of the third divison, hearing the firing and concluding that the reconnoissance of the fifth division were engaged, brought up all the troops he could rally about him, and taking up a position on the Austrian right flank, endeavoured to divert the attack from Cadorna's small force. At last the Austrians continuing to deploy in force, the Sardinians were obliged by superior numbers to fall back, and retired in good order. At Venzago, Durando receiving orders from the Emperor to form a junction with the first French *corps d'armée*, sent part of his force in the direction of Madonna della Scoperta. General Fanti having received no orders, held his position at San Paolo di Lonato.

It will be remembered that we left the first division of the French fourth corps under General Luzy in possession of Medole. The town having been cleared of the last of the Austrian troops, Luzy occupied himself in organising the defence, so as to be prepared in the event of an attempt on the part of the enemy to retake the place. This being accomplished, he formed his troops for the pursuit. One brigade marched upon Rebecco, which was found strongly occupied by a brigade of the Austrian fourth corps, while another Austrian brigade occupied the farms and enclosures in the neighbourhood of the village. Rebecco then became the scene of a sharp conflict, and Luzy feeling himself outnumbered, sent back to Marshal Niel to demand reinforcements. Niel sent forward a regiment in support, and thus reinforced, Luzy renewed the attack. The Austrian brigade fell back; but was just then relieved by another from the reserve.

General Vinoy commanding the second division of the fourth French corps had just arrived upon the plain, but being only accompanied by one battalion of chasseurs-à-pied, was obliged to halt for a few seconds and await the arrival of his leading brigade before advancing to the attack. The Austrians had brought up some batteries into position which, at this time, opened and swept with their fire the ground upon which General Vinoy was about to form. The General sent back to hasten up the divisional artillery, which, as they arrived, came into action and replied to the enemy's fire. Vinoy supported the artillery by two regiments, one on the right and the other on the left, both formed in echellon of columns; fresh batteries coming up in support of the French artillery already in action, De Grenneville found it necessary to fall back and avail himself of the cover afforded by La Casa Nuova and the wooded ground in the vicinity. Taking advantage of this retro-

grade movement, Vinoy took up a position in advance parallel to the one previously occupied. The third division of the fourth corps (de Failly) arriving in turn, Marshal Niel ordered one brigade in advance in the direction of the hamlet of Baite, in order to fill up the gradually increasing interval between the divisions Luzy and Vinoy caused by the divergence of the roads to San Cassiano and Rebecco, upon which the divisions moved. Another brigade was placed at the junction of the Cavriana and Guidizolo roads.

At about a quarter past nine a.m., the heads of the columns of the third *corps d'armée* (Canrobert) arrived near Medole. The Marshal had just received a despatch from the Emperor, informing him that a force of from 20,000 to 25,000 men having marched from Mantua, had their outposts about Aqua Negra, and conveying an order to support the advance of the fourth *corps d'armée.* The Marshal accordingly ordered Jannin to move with his brigade along the road to Ceresara. The two cavalry divisions, Partonneaux and Desvaux, having deployed in order to fill up the interval between the second and fourth corps, their batteries came into action and opened fire.

The Duke of Magenta had resolved to hold, for the present, the position which he occupied on the Mantua road, between the first and fourth *corps d'armée ;* but, seeing the forces of the enemy in his front momentarily augmenting, and fearing that they might establish themselves at Casa Morino as a fixed *point d'appui*, he took possession of the place. From thence he was able to obtain a more extended view of the field of battle, and, having reconnoitred the movements and force of the enemy, he moved up his columns and made the following dispositions. One brigade of the first division was deployed perpendicularly to the road, united on the right with

Desvaux's division of cavalry; another brigade of the same division formed the reserve. The second division was formed on the left of the first in echellon of battalion columns on a central point, supported on the right by two squadrons of the 4th chasseurs, and on the left by the cavalry of Gaudin de Villaine. These dispositions had hardly been completed, when large bodies of the Austrians were seen to deploy in the plain, Mensdorf's cavalry forming in the rear. The front of the Austrian line was covered by artillery, which came into action at from a thousand to twelve hundred yards' range. The four batteries of the first and second French divisions galloped forward to the line of skirmishers, and came into action. Two tumbrils of the Austrian artillery were blown up, after which they retired. It was at the commencement of this engagement that General Auger lost his arm. During the artillery action, the 10th Austrian hussars, moving under the cover of the trees, which covered the ground, approached the left of the second French division, with the intention of turning the left of the second *corps d'armée*. Passing the line of skirmishers, they charged; but Gaudin de Villaine's brigade of cavalry encountered them. They charged three times, but were finally driven among the squares formed by the first brigade of the second division. The successful action of the cavalry, and the fire from the Duke of Magenta's position, held the enemy in check on this point of the battle field.

The Emperor's head-quarters were at Monte Chiaro. Having received the report of the enemy's advance, he ordered the infantry of the guard to move at once upon Castiglione, and the cavalry also to march with as little delay as possible.

He then proceeded himself to Castiglione, and ascended to the top of the castle, from whence could be obtained a

view of the field of battle. The general officers who accompanied his Majesty could hardly believe that the Austrians had recrossed the Mincio, but the Emperor appears at once to have come to the conclusion that a general action was about to take place. Mounting his horse, he galloped to the position of the Duke of Magenta. Having satisfied himself as to the position and movements of the second and fourth *corps d'armées*, he passed over to the position of Marshal Baraguay d'Hilliers. The first *corps d'armée* had gained but little ground, but the occupation of Mont Finele had enabled the artillery to come into action and protect the movements of the first brigade, which, descending the hill, advanced against Solferino. The enemy's troops fell back from crest to crest of the ascent. The brigade sustained severe loss, and General Dieu, in command, was mortally wounded. By this time Ladmirault had succeeded in getting four guns in position on the left, to support a combined attack made by his two brigades under Douay and Negrier. The enemy's troops fell back slowly, but fresh batteries from the Austrian side opened fire with deadly effect. Ladmirault, although wounded, led the attack. He had just given the order to bring up his last reserves, when a second wound obliged him to resign the command to General Negrier. Bazaine, whose column had just cleared Le Grole, received the order at once to send forward the 1st regiment of zouaves in support. These troops advanced to the assault, supported by the 34th, and carried the crests; but, in order to secure them in these positions, it was necessary to move up the 37th. In the meantime, some guns, drawn up to the summits with great difficulty, opened a heavy fire upon the Austrian positions, and the houses at the gorge of Solferino.

On the Austrian side, one of the brigades of the fifth

corps d'armée (Stadian) had suffered severely and had abandoned the field of battle; the two other brigades of the same corps had fallen back upon the heights which surround Solferino, and had occupied the Tower, the Hill of Cypresses, and the Cemetery. The houses and walls of the village were loopholed, and, under cover of these defences, the Austrian troops, reinforced by some battalions from the first corps, took up their position.

Marshal Baraguay d'Hilliers ordered the artillery to open fire. There was much difficulty in getting the guns into position, but this having been overcome, a fire was opened at about three hundred yards distance. The Emperor, taking advantage of the high ground now in possession of the first *corps d'armée*, obtained a view of the whole extent of the field of battle. He came to the conclusion that the centre of the Austrian position was the point where the decisive blow should be struck, and that in order to force back the wings the central heights, which formed the key of the position, must be carried. The Emperor having determined this point, ordered a brigade which had not yet been engaged, supported by two batteries of artillery, to the front. Forey, putting himself at the head of this brigade, led them round by the right of the tower; but the troops which occupied that post, from their elevated position, immediately detected the movement, and opened a murderous fire upon them. The men at the heads of the columns fell fast, and the advance was checked. Forey had intended to act upon the rear of Solferino; but finding that, with the small force at his disposal, this movement was impossible, he demanded reinforcements. The Emperor at once ordered up the division of Voltigeurs of the guard (Cameon) in support. One brigade moved round to the heights on the left, while General Manéque, in command of the other

brigade, having detached two battalions to be placed at the disposal of Forey, ordered the remaining four battalions to take off their knapsacks, in order to prepare for the difficult ground they would have to encounter; then, advancing at their head to the attack, passed the brigade which, as already described, had suffered so severely, and, forming each battalion in a separate column, charged at the double, forced the enemy back, and carried everything before them. One battalion of chasseurs of the guard turned the village of Solferino, and a street combat ensued; eight pieces of artillery were taken, and a number of prisoners. Forey, upon the arrival of the two battalions of voltigeurs sent to reinforce him, resumed the offensive. Seeing that the enemy were falling back, he ordered the first brigade to advance to the attack of the Hill of Cypresses. At this moment, two batteries of the guard, under General Le Bœuf, arrived at the gallop, and brought a powerful fire from their howitzers to bear upon the enemy. The first brigade drove the enemy back from the heights and the Hill of Cypresses, while the second brigade gained possession of the hill upon which the tower was situated, and, finally, of the tower itself.

It will be remembered that Bazaine, having with great difficulty got his guns up on the heights to the left, opened a heavy fire upon the walls of the cemetery, the houses, and defences of the village of Solferino, just at the moment that Forey's division was engaged in the successful attack just described. Bazaine, judging the breach made by his artillery in the walls of the cemetery, to be practicable,—seeing also the successful progress of the movement made by the first divisions,—ordered his men to mount the last heights and carry the cemetery by assault. The third battalion of the 78th, two companies of the same regiment, and a detachment of the second division, leaving the

Austrian troops which held the position only time to receive them with a last volley, penetrated the defences, and, driving the enemy back in all directions at the point of the bayonet, cleared the cemetery. This last success was decisive; the village of Solferino, so hardly fought for and so bravely defended, was at last in the hands of the French. The troops which occupied the village and château seeing the fall of the cemetery, ceased to resist, and retired rapidly. Fourteen pieces of artillery and 1,500 prisoners were taken.

While these events were passing in the centre, the Duke of Magenta being informed by Niel that he was about to advance in the direction of Cavriana, found himself at last in a position to carry his support to the left and effect a junction with Baraguay d'Hilliers. On the right, Marshal Niel, who since the morning had resisted all the efforts made against him by the third and ninth Austrian corps, now saw fresh troops brought up to relieve those who had failed in their attacks against him. Vinoy, who commanded Niel's second division, had opened fire with grape upon the ground surrounding Casa Nuova, and thus prevented the enemy from issuing from the wooded cover of which they had availed themselves. The farm being then attacked and carried, the Austrians retired by the road to Guidizolo. Casa Nuova and the environs were then put in a state of defence by a party of engineers, under the superintendence of Colonel Jourjan. This position, in the subsequent moments of the battle, resisted all the efforts of the enemy to retake it.

The first division of the fourth French corps (Renault) having been sent to the assistance of the fourth corps, formed up in support on the right flank of Luzy's division, by which means he was able to concentrate his own force for the attack of Rebecco.

The first brigade of the third division (De Failly), commanded by O'Farrell, having at this time got possession of the hamlet of Baite, defended it obstinately against all the enemy's attacks.

Marshal Niel now sent to Canrobert to ask assistance and support for his centre, which was exposed to the constantly renewed attacks of the enemy.

Canrobert ordered General Trochu to take his first brigade to the position occupied by the fourth corps, and place it at Marshal Niel's disposal. It was about half-past twelve when Trochu, having ordered the men of his first brigade (bataille) to take off their knapsacks, marched to the assistance of the fourth corps. The brigade passed through Medole, the streets of which were encumbered with killed and wounded, and took the road by Rebecco to Giudizolo.

On the left, the Sardinian troops were at this time in a critical position.

The first division had suffered severely from the fire of the Austrian batteries.

Durando brought up some batteries from the rear to reinforce his artillery, already in action, and opened a heavy fire upon the Austrian position, but he was unable to check the determined advance of their columns. About noon Durando decided upon bringing into action the fourth battalion of Bersaglieri and a battalion of the 2nd infantry; reinforced by these fresh troops, the Sardinians succeeded in checking the battalions of one of the Austrian brigades (Gaäl), but the other brigade (Koller) continued to advance, so as to turn the right flank of the Sardinian position. It was at this moment that General Forgeat, commanding Baraguay d'Hillier's artillery, even in the heat and excitement of the successful attack upon Solferino, found an opportunity to observe the movement of these

Austrian columns, and opened upon them at 1,750 yards a heavy and well-directed fire, which carried disorder into their ranks and checked their further advance. On the extreme left, Cucchiari having formed the 11th regiment of infantry in columns of attack, supported by one battalion of the 12th regiment, directed them upon San Martino. The assault was temporarily successful, although the attacking force had to encounter a heavy fire of grape and musketry. The church fell into the hands of the Sardinians, as well as the surrounding farms, in which the Austrians had established themselves; but the enemy soon resumed the offensive, outflanked Cucchiari's division on the left, and opened a heavy fire of grape at about two hundred yards distance. The battalions on the left wing being obliged to fall back, left the flank of the right wing uncovered, which was in turn obliged to retire. Finally, Cuchiari was obliged to order the retreat of the whole division upon Revoltella, where he reformed his troops. The second division (Fanti) having been held in reserve till 11 a.m. had marched upon Solferino, in accordance with the Emperor's orders, in order to support, if required, the attack of Baraguay d'Hilliers; but while on the march Fanti received an order from the King to send one of his brigades to San Martino to act under the orders of Mollard, and to march himself with the other brigade upon Madonna della Scoperta to support Durando's division.

To return to the operations near Solferino. The Emperor, in the further execution of his design of forcing the centre of the enemy's position, ordered Manéque, commanding the first brigade of voltigeurs, to advance against Cavriana.

Manéque found himself exposed to greatly superior forces; his ammunition was also beginning to fail, when the Emperor ordered the grenadiers of the guard to advance

to his support. General Mellinet, who commanded them, wishing to leave to the voltigeurs the honour of terminating the affair which they had commenced so brilliantly, supplied them as quickly as possible with the ammunition which they required. Then supported by the artillery of the guard, under General Sevelinges Manéque, renewed the attack and succeeded in driving back the Austrian troops from the heights of Casa del Monte.

In the meantime Baraguay d'Hilliers, having given his men a few moments' rest, ordered Bazaine to reform his division and march in pursuit of Stadion's force, which was in retreat towards Pozzolengo. He occupied Solferino with Ladmirault's division, and, in accordance with the Emperor's orders, marched with his first division (Forey) to support the guards if necessary.

The Duke of Magenta having effected his junction with the guards, made his dispositions to attack. At a signal given by the Duke himself, the Tirailleurs Algeriens advanced by the left, and the 45th regiment by the right. San Cassiano and the adjoining farms were carried at the first assault. Passing quickly through Cassiano they made a vigorous attack upon Mont Fontane, occupied by two brigades of the Austrian seventh corps. The fannion of the tirailleurs was soon seen floating on the crest of the lower hills, upon which a portion of the artillery of the guard were got into position. At this moment the Duke of Magenta seeing the Austrians forming for a renewed attempt to penetrate between his own and Niel's corps, ordered his troops to halt in the positions which they occupied. Taking advantage of this pause, the Austrians attacked in turn and drove the French skirmishers back over the ground they had gained, till they rallied under the protection of the artillery. The French skirmishers returned to the attack, but were again obliged to fall back.

The Duke then ordered La Motterouge to support the first column of attack, and at the same time gave the order for the whole of his *corps d'armée* to advance. The assault of Mont Fontane was renewed, and after a desperate resistance the Austrian brigades were forced to retire and take up a position in rear of Cavriana, which the fire from the artillery had rendered untenable. With these sanguinary conflicts, in which the losses on both sides were great, terminated the efforts of the Austrian army to hold the centre of their position.

We shall now go back to the fourth *corps d'armée*, still seriously engaged on the right. Vinoy, in command of the second division, finding it difficult to hold his position near Casa Nuova, sent to General Partonneaux to ask assistance. The ground was unsuited to the action of cavalry, but, nevertheless, Partonneaux ordered General Clerembault to advance with his brigade to the support of the infantry. This movement checked the enemy, and allowed Vinoy to reform his troops in the position of Casa Nuova.

Luzy was still engaged at Rebecco. Marshal Neil found it necessary to apply to Renault, commanding the first division of the third corps, to send a reinforcement to the troops engaged at the village. Renault immediately complied, and the reinforcement which he sent meeting a force of the enemy, attacked them with the bayonet, drove them back, and thus freed the right flank of the fourth *corps d'armée*.

Niel then ordered Trochu, whose division had been placed at his disposal by Canrobert, to take up a position in the centre, to replace his own last reserves, which were now engaged. He then gave the orders to Luzy to march against the enemy in the direction of Guidizolo. The column advanced, driving the enemy in close to the first

houses of the village; but there, finding themselves in presence of large masses of the Austrian troops, they were obliged to fall back to a position near the hamlet of Baite.

About 3 p.m., Canrobert having arrived at this point of the field of battle, was able to appreciate the difficult position of Marshal Niel's forces. Having satisfied himself by reconnoissances in the direction of Castel Goffredo that he had now nothing to fear for the safety of the flanks and rear of the army from the forces which were reported to have menaced them during the morning, he recalled the division Bourlaky, which he had detached on observation, and left the brigade Collineau to cover Medole.

Upon the arrival of these reinforcements being reported, Niel determined upon another effort for the occupation of Guidizolo. He ordered Trochu to advance with his first brigade to the attack. Trochu formed his troops "*en echiquier*," in close columns of battalions, with the left refused, and in this formation marched against the enemy. One of the divisional batteries accompanied the attacking force moving across the fields till arrived within range.

At this moment of the battle the Austrian centre had been forced at Solferino, but the right wing had been successful and had driven back all the attacks of the Sardinian troops, while on the left the French had gained but little ground. In this state of things the Emperor of Austria, about 3 p.m., determined to resume the offensive, and ordered Count Wimpffen to make a general attack along the whole line of the Austrian position. The troops of the third, ninth, and eleventh Austrian corps, till now held in reserve, advanced to the support of the divisions in action. A portion of the second brigade of the first

division of the eleventh corps, was led by Prince Windischgraetz to the attack of Casa Nuova. The skirmishers covering the position were driven in, and the Prince, at the head of his own regiment, advanced under a sharp fire of musketry close to the walls of the farm; his troops formed in mass, followed him, keeping their order well, but at this moment the Prince's horse was killed and he himself struck by two shots fired from the loopholes of the farm. His soldiers, under a heavy fire, crowded round and endeavoured to carry off the body, when a charge *en Fourageurs* of a French regiment of lancers, well delivered, cleared the ground round the farm of the attacking force. The conflicts at Rebecco and Casa Nuova were as severe as those at Solferino and Mont Fontane, and it was not without heavy loss that the troops of the fourth *corps d'armée* held for so long their important positions.

It has been already stated that the troops in reserve all along the Austrian line had been ordered to the front, but some of these troops intended to support the attack upon the French right had not yet reached their positions, and were still upon the march.

The cavalry division of the first French corps had up to this moment been only employed with the cavalry of the guard in occupying the interval between the second and fourth corps, but General Desvaux, seeing the Austrian columns in march, determined, if possible, to arrest their movement. Considering that there was not time to prepare the attack of his cavalry by the action of artillery, he ordered General Planhol, commanding the brigade which formed his first line, to charge. The brigade advanced rapidly, but getting entangled in some ground planted with vines and intersected with small ditches, they did not reach the infantry till the squares were formed. Received by a heavy fire they were forced to retire, but Desvaux had

brought up his second line, formed of his second brigade (third Chasseurs d'Afrique), and Forton in command, as soon as the first line had cleared his front, charged; but this attack was also unsuccessful, and numerous casualties were caused by the infantry fire. Forton rallied, and reforming his squadrons, charged again; but although a few men penetrated here and there he could not succeed in breaking the Austrian squares, but the cavalry movement was so far successful, inasmuch as it arrested the march of the infantry columns and prevented their taking part in the attack upon Casa Nuova.

On the left of the allied forces a regiment of Sardinian grenadiers were forced back by the Austrian attack, and oblige to retire out of range to reform. On the extreme left Mollard found himself, without support, opposed to the whole of the Austrian eighth corps. Fearing that a retrograde movement would enable Benedek to reinforce the fifth Austrian corps, he determined to hold his position to the last. About 3 p.m. he received a despatch from the King, announcing the advent of a brigade to his support, and ordering him, in conjunction with the fifth division, to advance to the attack of San Martino.

General Trochu meanwhile had advanced against Guidizolo; encountering the enemy on the march, he sounded the charge, attacked with the bayonet, and drove him back to a point about half-a-mile from Guidizolo. Canrobert had ordered up artillery to support this attack, but the enemy had effected their retreat before they could come into action.

At the centre, as soon as Mont Fontane had fallen into the hands of the second corps, Maneque, at the head of his brigade, drove the enemy back from the heights as far as Cavriana, when the voltigeurs entered the town together with the Tirailleurs Algeriens. In the plain the second

division of the second corps had driven the Austrians from the farms and enclosures which they had occupied.

The Emperor of Austria observing that the movement he had ordered had failed, that this last effort was ineffectual, and that not even the devotion and bravery of the fine troops he commanded could retrieve the fortunes of the day, and now seeing Cavriana, where his head-quarters were established, in the hands of the enemy, gave the order for the general retreat of his army beyond the Mincio. At this moment, which must have been so trying to him upon whom it devolved to issue this final order, a storm, which had been gathering unobserved amidst the excitement of the battle, burst over both armies. The wind rose in furious gusts, and clouds of dust obscuring the view, passed across the plain. All action was momentarily paralized, and there was a pause in the deadly strife, the sound of the thunder succeeded the roar of artillery, which had filled the air so long, and the rain began to descend in torrents. In the midst of this turmoil of the elements, the Austrian movement of retreat commenced. To protect the retreat of the left wing, Guidizolo was occupied by troops, which remained at their post till about 9 p.m. To cover that of the centre, the heights beyond Cavriana were occupied by troops which retained them till about 10 p.m., while orders were sent to Benedek on the right to retire upon Salionze. Conscious of the general retreat of the Austrian army, overcome by the fatigue of protracted exertion under the burning sun, reaction, consequent upon exhausted human energies, ensued, and nearly the whole French army, as if by mutual consent, suspended all movement and rested from their labours. Some of the guards, accompanied by their own artillery, continued to advance as far as Madonna della Scoperta, when the guns opened fire upon the retreating Austrians at long range. Bazaine also having


Zaphalia
S.Martino
Pontecello
Pozzolengo
Madonna
d.Scoperto
Possesione
M.Croce
Solferino
Cavriana
Giudizzolo
Foresto
Castel
Grimaldo

continued the pursuit for about 2½ miles beyond Solferino, brought his artillery into action and opened fire from 1,500 to 2,000 yards distance upon the rearguard of the fifth Austrian corps in retreat upon Pozzolengo.

While these events were taking place on the right and centre of the allied position. The Sardinian troops on the left were making their last attack upon Benedek, who had only just received the order for a general retreat. Mollard formed his troops in two lines with a reserve covering his flanks. He also sent a portion of his force to the left under cover of the ground, with orders to attack in flank upon the first shot being fired from the main body. In the meantime Cucchiari was advancing to his support with his division formed in two columns. Directly the approach of Cucchiari was signalled, Mollard gave the order to attack, but at this moment the storm broke, and all action was for the moment suspended. As soon as its first violence had abated the attack was resumed. Four batteries came into action and prepared the way. The infantry then attacked, but only succeeded at first in carrying the farms and enclosures surrounding the position, but the artillery coming up at the gallop took up a second position and opened fire upon the houses and gardens of the town. The fifth division then advanced to the assault, and in spite of the determined resistance of the Austrian battalions left to cover the retreat, carried the position. A counter attack was made, but finally San Martino remained in the hands of the Sardinians. During this long and eventful day the Emperor Napoleon had not ceased for a single moment to direct the action, moving from point to point as great efforts became necessary, or the danger of partial failure was imminent, but he must have been fully rewarded for all this anxiety and exertion when from the heights of Mont Fontane he saw the dark storm-clouds

rolling off and disclosing the Austrian columns in full retreat. Master of the field of battle, and taking into consideration that his soldiers had been fourteen hours ithout food under a burning sun, the Emperor gave the ler for the troops to bivouac upon the positions which y held.

The battle of Königsgrätz was fought on the 3rd of y, 1866.

Benedek, having determined to concentrate his forces, cted a position in front of Königsgrätz, on the right k of the Elbe. Some high ground near the village of um, which is close to the main road from Horitz to igsgrätz, by Sadowa and the wooded heights near a, were chosen as the centre and key of the position. m, these heights spring underfeatures of ground in lulating slopes, with groups of small hills, separated by llow valleys, descending in front to the Bistritz, a small marshy river running along the whole front. Another marshy stream, called the Trotina, nearly at right angles to the Elbe, runs along a portion of the right of the position. The ground is generally undulating, and is covered with woods and villages. The Austrian position extended all along the heights from Racitz to Prim and Problus, a distance of about six and-a-half English miles, and was occupied on the morning of the 3rd by the Austrian and allied forces, consisting of the first, second, third, sixth, eighth, and tenth *corps d'armées*, together with the Saxon troops, posted as follows:—The Saxons occupied Prim and Problus, as well as the villages in front, situated on the heights overhanging the Bistritz, and were supported in rear by a portion of the Austrian eighth corps. Next on the right, the tenth corps, which had been much reduced, occupied the villages along the Bistritz, as far as Sadowa. The defence of the heights of Chlum and Lipa had been con-

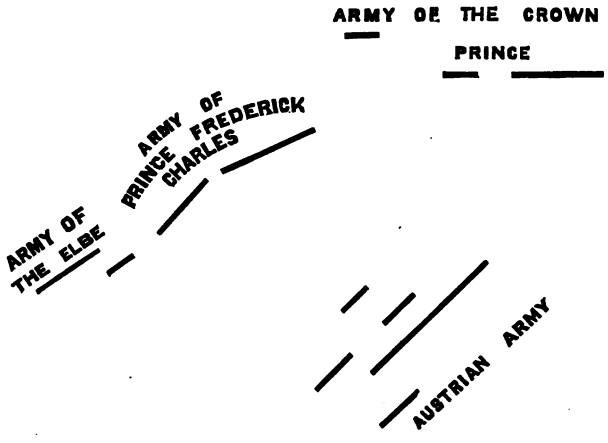
fided to the third corps, which also in conjunction with a portion of the tenth corps occupied the wood of Sadowa. Next on the right, the fourth and then the second corps, together with the remainder of the eighth corps, occupied the villages along the heights in the direction of Hormowes, with a brigade at Racitz. The right flank was, to a certain extent, protected by the Trotina, the marshy stream already mentioned, which runs through a narrow valley to the Elbe. The banks are steep and precipitous, and the passage of the stream difficult, but no precautions were taken to increase the difficulties or guard the passage by fieldworks, &c. The left flank was without protection (*en l'air*), and was therefore drawn back towards the last of the heights in that direction, near Prim and Problus. The first and sixth *corps d'armées* were formed close to Rosberitz, in rear of the centre, with all the cavalry of reserve on their left (twenty-eight regiments), and in their rear the reserve artillery (one hundred and twenty-eight guns). Owing to the peculiar formation of the ground, this position possessed many advantages—a clear view of the surrounding country might be obtained from the heights near Chlum and elsewhere, whereas the batteries and troops on the heights were, to a great degree, concealed from an approaching enemy. The valleys afforded protected localities for massing bodies of infantry, and the interior communications were not generally difficult or obstructed; but, above all, the range of heights selected afforded position for about five hundred guns, the artillery being the best arm of the Austrian service. In consequence also of the favourable conformation of the ground receding in some places in successive stages, it was possible so to post the batteries that a powerful concentrated fire might be brought to bear in several directions on an attacking force. The Austrian batteries were carefully posted, so as to take

advantage of this circumstance. Traverses were thrown up, and the batteries otherwise protected against the hostile artillery; but the ridges upon which the artillery were posted were in some cases so narrow that the horses and limbers were withdrawn to the rear and placed under cover of the ground, and this was subsequently one of the principal causes of the heavy losses in artillery sustained by the Austrians. Obstacles on the slopes in front, which might impede the action of the guns, were removed, and the different ranges indicated by marks on the ground. The two bridges of the Bistritz, at Sadowa and Nechanitz, were strongly guarded, as well as the passages of the Trotina, near Racitz; but it does not appear that much attention was bestowed upon guarding the other passages of the stream by the construction of fieldworks. Batteries and defensive works were thrown up for the protection of the centre of the position at Chlum and Lipa, and the wood near the latter defended by abattis and rifle trenches. Works were also constructed near Maslowed and Nedelist, but no further precautions seem to have been taken for the protection of the right flank. Bridges were thrown across the Elbe, in rear of the position. The large quantity of provisions and material collected in the fortress of Königsgrätz were available for the army.

On the 1st and 2nd of July, Benedek recalled the troops detached beyond Josepstadt, and thus raised the army of the north in position to over 180,000 men, exclusive of the Saxon troops, which amounted to more than 20,000. The Austrian troops had already suffered severely in their contests with the enemy, but the army was well supplied with provisions, and some days of uninterrupted rest had had a beneficial effect upon the spirits of the troops. Having thus concentrated his forces, Benedek awaited the attack of the Prussian army. It will

be seen, by a reference to the map, that the river Elbe was in rear of the position which it was necessary to bridge—a marshy stream in front, unfavourable to generally-offensive movement in that direction; that the left flank was *en l'air;* and that the right flank was only partially protected by the conformation of the ground.

On the 2nd of July, the King of Prussia had joined the army. He intended that the following day should be one of rest for the troops, and purposed himself to make a personal inspection of the state of matters generally. On the morning of the 2nd, Prince Frederick Charles sent out reconnoitring parties to verify reports which he had received of the enemy being concentrated in force in front of Königsgrätz. He appears to have seen the great advantage of bringing on a general engagement, with reference to the relative positions of the hostile armies, as shown in the accompanying plan.



If the game of battles could be played out like a game of chess, and when you had placed your opponent in an unfavourable position, from which he could not easily extricate himself, it should only require a turn of the hand to checkmate him, or at least to render the game hopeless. The relative positions of the forces indicated would seem to ensure success to the Prussian arms, according to all the rules of tactics; but in actual warfare many elements come into play which render the most likely results unattainable. The Crown Prince's army was certainly in a position to take the Austrians in flank, while the main army held them in check in front, and Hermarth's force was nearly as favourably situated; but the Crown Prince bivouaced during the night of the 2nd at a considerable distance from the field of battle. It had been raining for several days, and the ground off the main roads was hardly practicable for the march of troops, and the time occupied in traversing any given distance uncertain. Benedek might determine to withdraw across the Elbe, or to attack with overwhelming forces the army of Prince Frederick Charles, while separated from the support of the other armies. The Crown Prince's force consisted of the two divisions of the guards, and the first, fifth and sixth *corps d'armées*. The first division of the guards were at Königinhof, the advance guard on the right bank of the Elbe, and the second division at Rettendorf, on the left bank. The first had between eight and nine English miles to march before arriving on the field of battle, and the second more than eleven miles, and in addition to cross the river. The first division of the guards received their orders sooner than the others; the advance guard were on the right bank of the river, they had a shorter distance to march, and also took a short cut across the fields, which accounts for their arriving (as hereafter described) on the scene of action several hours before the second division.

The first *corps d'armée* bivouaced on the right bank of the Elbe, near Pransnitz, and had about eleven miles to march; the fifth and sixth corps passed the night of the 2nd between Gradlitz and Kukus on the left bank of the Elbe, and had, taking the routes of Melchow and Chotieborek, between thirteen and fourteen miles to march, and had also to cross the river. There were only three brigades with the sixth corps; one was detached to Josepstadt, and consequently only two brigades of this corps were engaged in the action; but the corps having been ordered for a reconnoissance to take place on the morning of the 3rd, were *en route* when the new order arrived, and were, therefore, early on the field.

General Hermarth's force (the army of the Elbe), consisting of three divisions, bivouaced during the night of the 2nd in the neighbourhood of Smidar, which was a little over seven miles from Nechanitz, the point at which they first came into action with the enemy; therefore, the difficulties produced by long marches and impracticable ground were not in this case so likely to interfere with the general plan of attack. The course taken by Prince Frederick Charles on the 2nd seems to have been as follows:—While awaiting the return of his reconnoitring parties he sent Lt. von Normand to the head-quarters of the Crown Prince, at Miletin, to ascertain whether he could co-operate with him on the morrow in a general attack upon the enemy's position; this seems to have been a hazardous mission, but Lt. von Normand was fortunate enough to escape the enemy's patrols, and returned with the information that the Crown Prince would be on the field of battle at 2 o'clock the next day. In the meantime, the reconnoitring parties had returned with the report that the enemy were in force at Sadowa and upon the neighbouring heights. Prince Frederick Charles then despatched General

Voigts-Rhetz, the chief of his staff, to the King's head-quarters at Gitschin, to communicate the intelligence which he had gained, and to propose a combined attack upon the enemy's position on the next day. The General arrived at head-quarters at about 11 o'clock that night and had an interview with the King, who at once consented to the proposal conveyed to him. There appears to have been much energy and decision displayed on this occasion at the Prussian head-quarters. There were reasons which might have been considered strong ones for the postponement of the attack of the Austrian position.

The troops were fatigued with long marches and required rest, the forces were, in some instances, separated by comparatively considerable distances from each other, from the head-quarters, and from the scene of action, in consequence of continued rain the ground was in bad order for marching, the time was short, and rapid communication of orders must have been difficult, but there does not seem to have been either hesitation or delay in taking the decisive step of rousing about 200,000 men from their bivouacs and concentrating them for a general action within a few hours. It was hardly midnight when the orders of detail were issued for the march of the three armies on the following morning. The head-quarters of the Crown Prince were about twenty-three English miles, and the head-quarters of General Hermarth over fourteen miles from Gitschin, the head-quarters of the King; nevertheless, before 4 a.m., on the 3rd, the necessary orders were in the hands of the authorities, and at 7 a.m. the three armies were in movement.

The plan of attack was the following, and was sufficiently simple:—Prince Frederick Charles's force, which was in the centre and nearest to the enemy, was to hold him in check, while the armies of the Crown Prince and

Hermarth (which each had some distance to march) gained the opportunity to attack in flank, the first on the right, the second on the left. In the meantime, Prince Frederick Charles, in order to guard against the possibility of Benedek taking advantage of the combination of his forces to attack the first army on the high road to Horsitz, had, between midnight and 3 a.m., united his forces, consisting of the second, third and fourth *corps d'armée*, near Millowitz. At 3 a.m. he marched to Dub, where he halted, in a position protected by the ground, but within two miles of that reported to be occupied in force by the enemy. From Horsitz he had already detached a division of the fourth *corps d'armée* (General Fransecky) to Cerewitz, about a mile and-a-half to the north-east of Dub, in order to cover his left flank. He told off one *corps d'armée* (the 3rd) as a reserve; the remainder, the second *corps d'armée*, and one division of the fourth (three divisions) being destined for the centre attack. The eventful morning broke with heavy clouds, fog and small rain, which continued most part of the day. The fog was at times so dense that it was most difficult to distinguish objects clearly, and the ground had been so saturated with continued rain that the movement of troops, particularly artillery, except on the high roads, was almost impossible. Those who have not had experience in these matters can hardly conceive how much such a state of the atmosphere and ground increases the difficulties of the march of considerable bodies of troops.

The reconnoitring patrols of the advanced guard brought in the intelligence that Sadowa, where the high road crosses the Bistritz, was strongly occupied, as well as the heights on the opposite side of the river. Shortly afterwards an engagement commenced at long range between the Austrian batteries posted beyond Sadowa and the Prussian artillery,

which came gradually into position as the reinforcements came up, taking advantage of some high ground favourably situated on the left of the high road. Here was an instance of an encounter between artillery protected and in position, and artillery in the open gradually reinforced as the batteries continued to arrive. According to general supposition this would be a most unequal contest, but it appears that the Prussian artillery held their ground so as to turn the Austrian fire from their own troops who continued to advance. About 8 a.m. the King joined the advance guard and assumed the command. This being the first time since the days of the great Frederick that the Prussian forces in the field had been commanded by their King.

The advance guard, formed of a division (Horne) of the fourth *corps d'armée*, continued the advance upon Sadowa. A little after 8 a.m. this division gained possession of the bridge of the Bistritz, at Sadowa. It was, as yet, impossible to ascertain the exact force or position of the enemy, but from the strong and continued reinforcements of the opposing batteries in front, the conclusion was drawn that the greater portion of the Austrian army was concentrated in front of Königsgrätz. In order to occupy the enemy, ascertain his position, and oblige him to deploy his forces, the King, about 9 a.m., gave the order to advance beyond the Bistritz. In fulfilment of these orders, the two divisions of the second *corps d'armée* passed on the right near the villages between Sadowa and Tresowitz; also the two divisions of the fourth *corps d'armée*, as follows—the division Horne on the centre, near Sadowa, while on the left the division Fransecky advanced from Cerewitz to Benatek.

These four divisions pressed forward, but soon found themselves opposed to superior forces and exposed to the

fire of the enemy's howitzers, from which they could obtain but little shelter from the ground. Their own artillery, nearly overpowered by the superior fire of the enemy's batteries, could afford them but little assistance; but still they fought their best to sustain the unequal contest and reply to the concentrated fire opened upon them. Casualties became frequent, but the men behaved well and held tenaciously the ground they had gained. In this severe contest the troops composing the division Fransecky, which then formed the left wing of the attacking force, were the most exposed. They could look for no support from the troops on their right, which were closely engaged and had enough to do to hold their own ground. It would have gone hard with this division if, during the considerable time they remained unsupported, the Austrians had made a concentrated attack with the forces of their right wing then completely at their disposal. The general plan of attack was (as already stated) to occupy the enemy in front by the central army, under Prince Frederick Charles, while the two armies, one on the right, under General Hermarth, the other on the left, under the Crown Prince, which were so favourably disposed for carrying out the manœuvre, should attack in flank. In furtherance of this plan, and while the centre army sustained their difficult part so well, the army of the Elbe marched from Smidar, forming one division (Etzel) in reserve, and advancing with the other two (Munster and Canstein) which composed the army, to the attack. Upon arriving at Nechanitz, the point at which they were to cross the Bistritz, they found the bridge had been broken down by the Saxons, and the advanced guard had to repair it under the fire of the enemy's batteries. The bridge being again practicable, the troops crossed over and occupied Lubno; the Saxons, falling back upon Prim and Problus, took up a strong position. In the

engagement which followed, the Prussian guns brought into action were outnumbered by those of the enemy. Amongst the latter were some breech-loaders which had been formerly presented by the Prussian to the Saxon Government as a *cadeau d'ami*, and it was a curious circumstance, that in this battle guns constructed in the same arsenals were in battery opposed to each other. One division (Munster) attacked the Saxon position in front, while the other (Canstein) threatened the left and manœuvred to attack in flank. After about an hour's hard fighting, the Prussians succeeded in forcing the position. In the streets of Prim and Problus the Saxons held their ground with determination, and fought from house to house, but it ended in the Prussians remaining masters of the two villages.

The second *corps d'armée* having effected the passage of the Bistritz, moved upon Dohalicka, having, after a severe contest, possessed themselves of the woods and villages which cover the valley of the Bistritz. Then nearly 200 guns in position on the heights opened upon them for some hours. They were exposed to this terrible fire; and from hour to hour it became more and more difficult to hold their position.

The two divisions of the fourth *corps d'armée* were in positions little less perilous. Horne's division was posted in a wood on the east of Sadowa, which had been taken after severe fighting. Fransecky, on the south-east of Benatek, occupied a small wood in front of that village which he had gained with difficulty, and by means of which he established his communications with Horne's division. Prince Frederick Charles, taking into consideration the great losses sustained by these two divisions, and also the length of time they had been under fire, determined upon bringing up his reserve (the third *corps d'armée*) to

Sadowa, to support or relieve Horne's division. But at last the expected succour appeared, and this long-endured struggle seemed about to terminate. The second move of the great game was about to be played. At a quarter past eleven the first division of the guards, marching at the head of the Corps de Garde, was seen on the left, crowning the Heights of Chotieborek. They had moved to the scene of action by a forced march, and without a moment's loss of time. The rest of the second army had not yet arrived, and some of the troops composing it were still far in the rear. This support did not arrive a moment too soon. Fransecky's division, which had borne the brunt of the battle so long, had been at last forced to retire as far as Benatek, and it was there that their leader addressed his division in the following words:—"Men, we have retired far enough; here we must stand or die."

The thirteen battalions which composed the first division of the guards, supported by their own artillery and four battalions of the sixth corps, moved at once *upon* Horzinowes, the extreme left point of the Austrian position. The immediate result of this movement was, that the Austrian batteries, which had so long played upon Fransecky's division with such telling effect, were forced to direct their fire against this new enemy who had risen so suddenly and unexpectedly before them, for it has been stated, that although from the heights upon which the Austrians' right wing was posted the surrounding country might be seen for a considerable distance, and that from one tower in particular an extensive view might be obtained, they were not aware of the approach of the Crown Prince's forces. Another result of this movement was, that a great part of the Austrian artillery, which had almost overpowered the left of Prince Frederick Charles's army, were withdrawn, in order to oppose the batteries of

the guard, as well as of the sixth *corps d'armée*, which now began to show itself. This *corps d'armée* (Gen. Mutius) having arrived at the Trotina, one division (Zastrow) found the passage at Radschitz strongly guarded; but, after some hard fighting, succeeded in passing the river. Another division of the same corps (Groudzinsky) passed more to the south-east, and close to the Elbe, at the village of Trotina. These movements enabled these two divisions to threaten the right flank of the Austrian right wing, while the guards attacked in front; the consequence was that the troops of the Austrian right wing were withdrawn from Horzinowes to the Heights of Sendraschitz, where they were established in a position on the flank nearly at right angles with their line of battle. The defence of the most important bridge of the Trotina, where the high road from Josephstadt to Königsgrätz crosses the river, was confided to a brigade of the second *corps d'armée*, composed of the regiments of Hesse, and of the King of the Belgians, and three battalions of Chasseurs. These troops were also reinforced by detachments from the Saxon divisions, accompanied by some troops of horse artillery; but this position was forced in turn. The division of the guards got possession of Moslowitz, while one division of the sixth *corps d'armée* carried Sendraschitz, and the other Trotina. The two *corps d'armées* composing the right wing of the Austrians, taken in flank by the fire of 42 guns of the sixth *corps d'armée*, while the artillery of the guard continued a heavy fire in front, were forced to fall back before the Prussian attack, and take up a third and last position upon the Heights of Chlum and Nedelitz.

This energetic and successful attack of the forces of the Crown Prince gave breathing time to the army of Prince Frederick Charles; the fire of the Austrian batteries, from which they had suffered so long and so severely, momen-

tarily diminished, and with renewed energies these troops, who had played their difficult part so well, prepared once more to take the offensive. The third *corps d'armée* was ordered to the front to take up a position beyond Sadowa, from which they could bring the fire of their batteries to bear upon the Austrian position at Chlum; by this means 500 of the Prussian guns were brought into action at once. The division Fransecky, forgetting their losses and many hours of endurance, marched on the right of the first division of the guard to the attack of Cistowes, which they carried, and thus established the communication between the army of Prince Frederick Charles and that of the Crown Prince, and at this opportune moment the first *corps d'armée* arrived upon the field of battle ready to fill up the interval.

The first division of the guard continued their advance, carrying everything before them, until they at last found themselves in the centre of the Austrian position before Chlum. In consequence of the difficulties of the ground their artillery could not keep up with them. The second division of the guards had not as yet arrived, and the first division was thus so far isolated; but their leader, feeling that this was one of the few moments which sometimes occur in the midst of a battle, when to dare is to conquer, without waiting for support, advanced his division to the assault of the stronghold of the Austrian position, and prepared, under the heavy fire of the batteries, to storm the heights of Chlum. The good fortune which is said to attend a bold attempt seems to have been theirs upon this occasion, for the Austrians, not anticipating so sudden an attack upon the point which actually formed the key of their position, had guarded it by only one brigade (Appiano) of the third *corps d'armée*. The guards sending a detachment to the attack of Rosberitz dashed forwards, taking

several batteries on their way, and after a sharp conflict got possession of Chlum and Lipa. The detachment sent to the attack of Rosberitz was also temporarily successful in carrying that village, in rear of which was formed the whole of the Austrian reserves. Benedek had been to visit the position of his troops at Nedelitz, where they were still engaged with the Prussian fourth *corps d'armée*, and it was only upon his return that he became aware of the daring movement which had placed the enemy in his rear. It appears that in coming back and turning to visit the reserves at Rosberitz he ran great risk of coming across the Prussian detachments and of being made prisoner. The reserves and other available forces of the Austrians were quickly formed for the recovery of the lost positions.

The guards, now attacked on all sides, found themselves in a critical position. Rosberitz, although momentarily carried, was feebly occupied and was lost, but retaken and held by the second battalion of the 3rd regiment of the guard.* The Austrian columns returned four times to the assault of Chlum and Lipa, but without success. It was now that the rapidity of fire of the needle gun told; every man of the guards fought his best, and every man armed with the needle gun was equal to five armed with the muzzle loader; and before long the guards saw the welcome aid arrive, the advanced guard of the first *corps d'armée* appeared upon the field of battle, and formed up in support. At last the Austrians abandoned the attack, and relinquished all hope of recovering their central position;

* This is the moment of the battle which has been chosen by a Prussian artist, Otto Heyden, for illustration in a clever picture, called "La Battaille de Königsgrätz," exhibited in the Exposition Universelle in the Palais de l'Industrie à Paris. The title of the picture is "Entre quatre et cinq heures du soir le Prince Frederick Charles und Prince Royal de Prusse se rencontrérent sur la hauteur de Chlum centre de la position Autrichienne après avoir combatta séparément depuis le matin."


Zelkowitz
Cernutek
Benatek
Horenowes
Racitz
Rodow
Majlowed
Cislowes
Trotina
Sendrasitz
Lipa
Chlum
Nedelitz
Langenhof
Rosberitz
Lochenitz
Stresetitz
Predmeritz
Swetl
Wsestar
Rosnitz
Prim
Plotisl
Charbusitz
Stosser
Kuklena
KUNIGRATZ

little by little the fire from the Austrian guns abated, as battery by battery they were withdrawn from the positions from which their action had produced such deadly effects. Most of the guns which had been placed in battery were taken, but the field batteries were well and effectively worked to cover the retreat; they moved rapidly to positions on the heights near Rosberitz, where they came into action, and under their protection the infantry of the centre and left wing commenced an orderly retreat. This was the moment when the thrilling thought comes into the hearts of thousands on one side, "We have conquered;" and on the other, "We have lost." But this momentary pause was soon followed by energetic action. The whole Prussian line charged up the slope at the double. Upon each height the Prussian batteries came quickly into action, and their concentrated fire, combined with the rapid and unceasing discharges of the needle gun, carried death into the ranks of the retreating columns; but, as Hozier relates in his account of the seven weeks' war,—"The Austrians kept their formation, and such a retreat under such circumstances is as creditable to the valour of the Austrian troops as a battle won."

Of the subsequent events of this battle there seem to be conflicting accounts, amongst which it is difficult to choose. I think, therefore, that I cannot do better than quote the words of Col. von Besser, who was an eye-witness of the scene, and who, in his interesting work, "The Prussian Cavalry in the Campaign of 1866," just published, and which has excited much interest, gives full details of the concluding scenes of the battle and pursuit of the light cavalry.

The cavalry corps of Prince Albrecht had bivouaced on the night of the 2nd of July to the west of Horsitz, in the neighourhood of Anjezd. Sylvara and Gutwasser

receiving further orders during the night, they marched, taking a southern direction, upon Liskowitz-Psanek and Sucha. It rained incessantly during the whole night, and the ground became so soft, that the horses sank up to their fetlocks.

The next morning the weather was chilly, the men had had no breakfast, and cloaks were put on.

At about 11 a.m., when the fighting at Sadowa and the neighbouring woods was at the hottest, the cavalry again moved forward in the direction of the marshy ground near the Bistritz, as far as Johaneshof, where they struck northward, and about 1 p.m. reached the western issue of Sadowa.

Here the cavalry bivouaced on either side of the road, the horses were fed, and the men partook of their scanty rations. Anxiety was written upon every face; for the battle was raging on all sides, and it seemed impossible that the Prussian troops could sustain the contest, opposed to an enemy numbering twice their force.

At this moment the King, accompanied by his staff, arrived from Dub. Cheers resounded on all sides, and the King rode through the ranks, with a friendly and encouraging word for all. Many anxious eyes were turned in the direction from which the long-expected forces of the Crown Prince were to arrive.

It was nearly half-past two, the crisis was at its height; but at this moment the news was announced from all sides that the Crown Prince had at last arrived upon the left flank, and that the positions of Horenowes, Maslowed, and Chlum had become untenable, and that the enemy were drawing back towards Königsgrätz.

The word was given—"cavalry to the front," and the King, putting himself at their head, gave the order for a general pursuit. It was now between four and half-past.

The third light cavalry brigade, under Count Gröben, crossed the Bistritz by the bridge, close to Sadowa, about 2,000 yards to the left. The Duke of Mecklenburg at the head of the second light cavalry brigade, consisting of the 3rd (Ziethen) Hussars, followed by the 11th Lancers and the 2nd Dragoons of the Guard, moved in the direction of Langenhof.

The third light cavalry brigade, consisting of the 3rd (Neumark) Dragoons, followed by the 12th (Thuringer) Hussars, having crossed the stream, formed up in squadron columns of divisions. Count Gröben having made a reconnoissance to the front, gave the order to advance in the direction of Rosberitz, to the attack of an Austrian battalion, which had just evacuated that village. The Thuringer Hussars formed on the left of the high road, and having just passed Lipa, were in the right direction for the attack.

The 3rd Dragoons having taken the Sadowa road, to the right towards Langenhof, became separated by a considerable distance from the Thuringer Hussars, in consequence of which only the third and fourth squadrons of the dragoons received the order to support the movement, which they carried out by forming in echellon on the right flank of the hussars; in this formation, six squadrons strong, the brigade advanced. As they neared the point of attack, Colonel Von Barnikow, in command of the hussars, became aware of the vicinity of two large infantry divisions of the enemy in retreat, accompanied by their artillery. In order to fall upon the enemy without giving them time to form, and also to preserve his own troops from suffering too severely from their firing during a slow advance, Colonel Von Barnikow gave the word to gallop, and then to charge; the enemy's battalion was overridden, and dispersed, but at the same moment the hussars were taken

in flank by a heavy volley from the infantry division on the left, while an equally severe fire was opened upon them from the other divisions on the right; but the charge of the hussars had its effect, the enemy's divisions gave way in all directions. The artillery mount and prepare to drive off; seeing this, Count Gröben, with several officers and a portion of the fourth squadron of the hussars, charge and cut down the drivers. The third squadron presses the retiring masses of the infantry, and everything promises a success, when at this moment a strong body of the enemy's cavalry appears at a short distance on the right flank. This force, according to Austrian authority, consisted of the first reserve cavalry division, Prince Holstein. The Brigade Schindlöcher on the right, consisting of Stadion's Cuirassiers and two squadrons of the 11th (Franz Joseph) Cuirassiers, and the 4th (Franz Joseph) Lancers in support; and on the left, to the rear, Prince Solmes' Brigade; the Emperor Ferdinand's Cuirassiers, with the Prince of Hesse's Cuirassiers in echellon formation, to the rear of the left flank.

The 4th and 5th squadrons of the 3rd (Neumark) Dragoons were the first to perceive the advance of the enemy, and the 5th squadron, which was the left squadron of the two, seizing the opportunity, takes ground by divisions to the right, passing in rear of the 4th squadron, which continued to advance in support of the hussars, and thus, concealing the flank movement, wheel into line and charge down upon the left flank of Stadion's Cuirassiers, who were advancing in column of squadrons. They were fortunate enough to break through the first squadrons of the enemy, but were overpowered by the shock of those following, and were carried forward with the throng of the advancing enemy.

In the mean time, the officer commanding the Thuringer

Hussars, seeing the advance of the enemy's cavalry, and feeling that his own men now mixed up with the infantry and artillery were in no fitting position to receive their attack, sounded the *appel*, and drew back his regiment to reform; but the cuirassiers are upon them, the right wing is at once engaged in a desperate conflict, hussar and cuirassier in one indiscriminate throng, at full speed and fighting hard, dash through the village of Langenhof. The 4th squadron of the Neumark Dragoons, which had not joined in the charge of the 5th squadron upon the retrograde movement of the hussars, fell upon the rear of the enemy's cuirassiers as they passed on to the attack; at this moment, so critical for the Neumark Dragoons and Thuringer Hussars, a welcome succour appeared in sight. The 4th Pomeranian Lancers, which had been marching on the high road in the direction of Streselitz, emerged upon the plateau of Lipa.

When Colonel V. Kleist, commanding the lancers, saw the Thuringer Hussars gradually giving way and hard pressed by the enemy, he ordered his regiment, which had just passed through a long defile and was marching in regimental column of divisions, to form up, and as soon as his 1st and 2nd squadrons were formed, he charged down with these two squadrons in echellon upon the enemy's cuirassiers. After some minutes of hard fighting, in which Colonel V. Kleist was cut down, the 4th and 5th squadrons of the Neumark Dragoons joining in the *mellée*, the enemy were driven back with great loss, and the 3rd squadron of the lancers having now formed, took up the pursuit; but a fresh body of Austrian cavalry, part of Prince Solmes's brigade, consisting of two squadrons of the Emperor Ferdinand's Cuirassiers, having arrived on the ground, turn to attack a company of Prussian infantry under Captain V. Liebelt, posted near some neighbouring sheepfolds. The

Prussian cavalry now engaged are in no favourable position to oppose these fresh troops, when most opportunely, the Ziethen Hussars, at the head of the 2nd light cavalry brigade, appear upon the ground from the direction of Sadowa. Riding-master V. Theile, commanding the 2nd squadron of the Ziethen Hussars, at once charges the two squadrons of the enemy's cuirassiers last arrived, forces them back, and pursues as far as the neighbourhood of Rosnitz, until he is checked by the fire of the enemy's artillery; H. R. H. Prince Albrecht charged with this squadron. The *appel* is sounded, and the squadron reforms upon the ground to the south of Langenhof.

V. Theile was in the act of reforming his squadron, when he became aware of a third squadron of the enemy's cuirassiers approaching on his left, and about to attack; the two squadrons, also, which had just been driven back, having rallied, returned to the assault; but passing round by the east of the sheepfolds, they were received by Captain V. Liebelt with a heavy volley, which stretched the greater number of these brave fellows on the ground. In the meantime, V. Theile charges the third squadron of the cuirassiers, and after a short contest forces them back, and pursued as far as Streselitz. While this action was going on as described, the Cuirassiers of Hesse were seen advancing from the direction of Problus, having apparently turned with the intention of attacking the Prussian batteries posted between Langenhof and Streselitz. The Duke of Mecklenburg, putting himself at the head of the three remaining squadrons of the Ziethen Hussars, charges down in echellon formation upon the advancing main body of the Cuirassiers of Hesse, and drives them back.

Three squadrons of the 4th Lancers, and half the fourth squadron, under the command of Riding-master V. Schulz, detached to protect the infantry, were ad-

vancing in the direction of Streselitz, when they were attacked by another body of about 200 of the Cuirassiers of Hesse, also advancing from the direction of Problus.

V. Schulz sent the half of the fourth squadron to attack the left flank of the enemy, while he himself, with the remainder of the lancers, charged in front. After a short fight, the cuirassiers were broken and driven upon some quarries, at the brink of which a company of Prussian infantry (35th Regiment) posted there received them with a volley, which emptied most of their saddles.

The Prussian loss in the foregoing contests was very considerable.

Count Gröben, shot through the body.

Thuringer Hussars.

Officers	Wounded, 4.
Hussars	Killed, 6. Severely wounded, 13. Slightly, 24.

Horses—Killed and wounded, 57.

Fourth and Fifth Squadrons, Neumark Dragoons.

Officers	Wounded, 4.
Non-commissioned officers	Killed, 2. Wounded, 9.
Privates	Killed, 10. Wounded, 60. Missing, 17.

Horses—Killed, wounded, and missing, 95.

4th (Pomeranian) Lancers.

Officers	Wounded, 4.
Privates	Killed, 7. Wounded, 19.

Horses—Wounded, 40.

Ziethen Hussars.

Officers	Wounded, 4.
Non-commissioned officers	Wounded, 6.
Hussars	Wounded, 18.
Horses—Wounded and missing, 381.	

At the commencement of the pursuit, the 3rd (Neumark) Dragoons, having passed Sadowa, and turned the small wood to the right of the village, formed in squadron columns of divisions, but they were impeded in their advance by the accidents of the ground, and also by the march of other troops, so that the brigade order to support the intended attack upon Rosberitz never reached its destination, and it was only the fourth and fifth squadrons that joined the advance of the Thuringer Hussars. The commandant of the Neumark Dragoons was therefore free to seek a field of usefulness for himself; he took the direction of Streselitz, under a heavy fire, but taking advantage of the cover afforded by a slight undulation of the ground, he made his dispositions to attack the enemy's batteries in flank; it was then that he became aware of the approach of an Austrian brigade (under Count Windischgrätz). The dragoons advanced slowly, and then retired, partly to draw the enemy under the fire of the Prussian infantry, formed in their rear, and partly in order to fall back upon the support of other cavalry regiments. In the meantime the Austrian brigade continued to advance steadily at the trot, and finally approached so close that the dragoons were obliged to make their dispositions for immediate action; when they had wheeled round and formed to the front, the Austrians were also in line ready to attack. The cuirassiers regiment (Prince Karl) in front, and the cuirassiers regiment (Count Wrangel) divided into wings, and forming retired defensive flanks.

The Austrians advance at a trot, with unbroken ranks and perfect dressing, but Lieut.-Colonel Willissen, commanding the dragoons, finding that his own left flank slightly outflanked the right of the enemy, charged at a distance of 150 paces; the shock was tremendous, both lines were broken; the third squadron of the dragoons overlapped the flank and fell upon the rear of the cuirassiers, but at last the dragoons, only three squadrons in strength, were compelled to give way before the superior numbers of the cuirassiers, and drew off slowly, still fighting. At this moment, the Brandenburg Lancers, under Prince Hohenlohe Ingelfingen, approached the scene of action from the east of Streselitz, and clearing a deep hollow in squadron columns of divisions, formed and charged down upon the left flank of the cuirassiers brigade. This flank was not now in a position to withstand the shock of this new attack by fresh troops. The whole of the troops on the left flank of the brigade gave way and broke; one portion of them fled with their standards in a southern direction, pursued by a body of the lancers; another portion, about a squadron and a half strong, had been taken in rear by another body of the lancers, and driven by them in a northerly direction towards some deep hollows and ravines, lying to the east of Streselitz. Those who escaped the pursuit of the lancers dashed into these hollows, and were shot down by a detachment of the 35th Prussian infantry.

The troops on the right flank of the Austrian cuirassiers brigade, which had suffered the least from the flank attack of the lancers, continued their advance in a northerly direction, suffering severely from the heavy fire; they charged the bodies of the 35th and 49th regiments of infantry, which lay in their way, but were driven off with loss.

Notwithstanding these failures, and decimated as they were, different bodies of this brave cavalry brigade charged home into the batteries, Eckenstein, Gayl, and three others. Here they were to find the goal of their heroic gallantry crushed by the fire from five batteries; these gallant fellows met, almost all, the death they were so fearless of. The Prussian losses in these actions were as follows:—

First, Second, and Third Squadrons, Neumark Dragoons.

Killed	2 officers. 1 non-commissioned officer. 1 trumpeter. 3 privates. 3 horses.
Wounded	7 officers. 10 non-commissioned officers. 72 privates. 29 horses.

Total killed and wounded: — 11 non-commissioned officers, 81 privates, 44 horses.

The Brandenburg Hussars.

Killed	4 hussars.
Wounded	3 officers. 35 hussars. 28 horses.

The first cavalry division under Major-General V. Alvensleben had, about three o'clock in the afternoon of the day of the battle, received orders to support the Elbe army; in consequence, the light cavalry brigade, Rheinbaden, consisting of one dragoon regiment of the guard, at the head, followed by the first and second Lancer Regi-

ments of the Guard, broke up from Johanneshof, where the division had been concentrated for some time, and marched in the direction of Nachanitz. The brigade during their march were exposed to a continuous fire, and Riding-master V. Bodelschwing, of the First Dragoons of the Guards, when near Lubno, fell mortally wounded.

The brigade crossed the Bistritz at Nechanitz soon after four p.m. The Commandant of the Dragoon Regiment, Lieut.-Colonel V. Barner, had received the order to report his arrival upon the scene of action personally to General V. Herwarth, commanding the Elbe army. It was impossible to find the General in the midst of the tumult and confusion raging on all sides, and nothing remained for him but to use his own discretion, and ride forward into the action; so putting himself at the head of his own regiment he took the direction of Problus; the advance of about five or six miles over broken and intersected ground, mostly covered with standing corn, at an uninterrupted trot, had considerably exhausted the horses during their advance; they encountered different parties of their own cavalry, the fifth, sixth and seventh Lancers, and a portion of the Neumark Dragoons were seen in the direction of Streselitz. As they still advanced they came in sight of a body of the enemy's cavalry to the east of Problus, which had hitherto been concealed from their view, consisting of the brigade Meugden. The King Ludvig of Bavaria's Cuirassiers on the right, the 11th (Alexander) Lancers on the left, and Count Neipperg's Cuirassiers in reserve: these troops had not as yet been in action.

The Alexander Lancers detaching themselves from the left of the brigade moved forward in the direction of the dragoons, who deployed at once and attacked both; regiments charged well home and mutually broke through each others ranks, a general *mellée* and hand-to-hand con-

flict ensued, and for some minutes, the fighting masses surged hither and thither. Some files of the Austrian lancers rode between the intervals of the guns of Captain Caspasy's battery, which was attached to the Prussian regiment, and which, during the intermingling of friend and foe, had ceased firing. The dragoons at last prevailed in the desperate struggle.

The lancers were forced back, the greater portion towards Streselitz, and the remainder took a southern direction. The first were encountered by the regiment of Blucher's Hussars, under the command of Colonel V. Flemming, which had just appeared upon the battle-field from Unter Dohalitz; in spite of their disordered formation, the lancers stood the charge of the hussars bravely till taken in flank by the fourth squadron of the regiment, they broke and fled towards Streselitz.

At this moment, the first lancers of the guard of the brigade, Rheinbaben came upon the ground, and Colonel V. Colomb, commanding the regiment, was ordered by General V. Rheinbaben to take up the pursuit, and the lancers suffered severe losses in their retreat.

Generals V. Alvenslaben and Rheinbaben took part personally in this part of the action. In general, the different parties of the enemy's cavalry, scattered in retreat towards Streselitz and Laugenhof, mostly succumbed to the fire of the Prussian artillery and infantry stationed in the above-mentioned places; but one body of the Alexander Lancers held together in a most extraordinary manner till they reached the neighbourhood of Lipa, where his Majesty the King had taken up his temporary position; they had the temerity to dash forward and attempt a surprise, but a battalion of the thirty-fifth Prussian infantry received them with a murderous volley, and most of these brave men were sacrificed.

I shall now conclude with an extract from a lecture delivered at the U. S. Institution on June 26th, 1868, by Colonel Walker, C.B., Military Attaché, Berlin, which gives a graphic account of an incident in the battle.

"At about 8 p.m., the Crown Prince, attended by a remnant of his staff, which had been gradually diminished by the despatch of orders, and by the weariness of horses which were no longer capable of moving out of a walk, encountered the head-quarter staff in a meadow between Problus and Langenhof; a more impressive scene has seldom been witnessed. The King, warned of the approach of his son, turned his horse, and riding through his staff, met him in the open space between the two parties of horsemen. Such moments are rare in any life, and the spectators of the interview may well be excused for the tears of emotion that filled all eyes. The Crown Prince had repeatedly kissed his Majesty's hand, when the King, opening his arms, father and son were wrapped in a mutual embrace. As they turned away in a proud attempt to master their emotion, the King, holding out the Cross of Merit, thrust it into the Prince's hand with these words, 'Take it, for you have deserved it.' It was a complete surprise. The telegraphic communication that the cross had been conferred for the victories of the preceding week having fallen into the hands of the Austrians, another warm embrace, and a few words of broken thanks, brought the affecting interview to a close. The very ground on which the meeting took place was strewn with the dead and wounded; a declining sun shed its rays full on the group, while far away towards Königsgrätz and the great southern high road, was heard the distant roar of that noble artillery, which, whatever its misfortune and losses may have been, won on that day the respect and admiration of all who were exposed to its fire."

Taking a retrospective view of the battles fought since the earliest periods, as well as a general view of the battles of our own times, it will be seen that the tactical manœuvres used throughout, when taken in their simplest form, and divested of all accessories, may be condensed into a small compass. The turning movement, or attack in flank; the centre attack strongly reinforced, while the flanks of the enemy are retained or kept in check. The oblique attack, or an attack with one flank strongly reinforced, while the remainder of the troops are retained or held in reserve.

In fact, as in the minor tactics, we can only advance or retire in some line formation, move in column, or pass from one formation to the other; so in tactics on a more extended scale, we can only attack in flank or on some central point, for, as a general or preliminary movement on the field of battle, the attack in rear must be excluded; and the attack in front, in which the opposing forces are engaged at all points at the same time, has been long exploded. Success in these few and simple manœuvres seems, with the exception of the middle ages, to have been attained since fighting was reduced in any way to a science by the same means, and failure to have been produced by the same causes. Attention to detail training and discipline producing rapidity of movement, steadiness and precision, added to good leading, seem always to have gained the day against those who trusted to strong or fortified position, or numerical superiority. But it has been shown that the combination above stated must exist in order to ensure any great or permanent result. The leader must have the means to work with. Accordingly we find all great commanders, from the earliest ages, bestow their time and labour upon getting their armies into working order before leading them into the field. Latterly, this purpose

has been mainly carried out by the formation of camps for exercise, where movements on a large scale are practised.

At all these different epochs matters seem to have taken pretty much the same course. First, a time of preparation, during which some new trick in the art of war, or some new invention in the destructive weapons, or change in the composition of armies takes place, which, when brought into play, gives the troops who have acquired it a decided and preponderating superiority over the rest, who for a time adhere pertinaceously to the old system, till at last some one particular nation suddenly appreciates the value of the new introduction, adopts it, and then the rest of the world follow lead, and for a certain lapse of years everything relating to the art of war remains in a state of equality, till new events force into existence some fresh leader who has the genius to devise a new system, and from his position the power to carry it into execution. In the old-world times, of which I have written, the same course seems to have been repeated more than once. At first the changes were, to a certain extent, radical, and produced actual periodic revolutions in the art of war; but in later years this art has, like everything else, been so far developed, that the changes introduced have become more partial, consisting in improvements in some particular arm or in some of the details of tactics.

But we have reason to conclude that the same causes will produce the same results as long as the world lasts, and that in future the nation or government which has utilized the time in perfecting some improvement in tactical arrangement which shall increase the rapidity of movement or action of their troops, will, at least for the time, gain the superiority. I think experience of the past has also proved that rapidity and precision in movement furnishes not only the means of success in attack, but also the power of parrying

the blow, and by means of the counter-attack turning defeat into victory.* There are always moments during the progress of the best concerted attacks, when a rapid move and attack from a portion of the enemy's forces may disconcert the whole plan. The force to which may have been consigned the retaining role may be temporarily shaken and forced back, and if the enemy possess the power given by steadiness and rapid movement to push their success, before reinforcements can arrive, the detaining force might be completely defeated, and a rapid change of front might throw the successful troops upon the flank and rear of the attacking force. There may be also cases in which troops do not arrive at the points where their action is intended to produce some important result for a considerable time after that calculated upon, and then a rapid and determined movement may throw out the combination and alter the fortunes of the day. It will have been observed that, except upon some rare occasions, the forces attacked seemed paralyzed and awaited in their positions the consummation of the organized attack, whatever it may have been. This want of action at critical moments may originate from various causes:—

1st. Want of information as to the real state of things, the position of the enemy's forces, and the indications which may exist as to his plan of attack.

2nd. The fear of being compromised by a forward movement without the certainty of timely support, or by a

* At Rosbach the French and German armies, under Soubise, made an attempt to turn Frederick's position by a flank movement, the King watched the movement, and when he was sure of the intention, sent Seidlitz' cavalry, 4,000 strong, under the protection of the ground, to make a counter-movement by attacking and driving back the heads of the attacking columns. The comparative mobility of his artillery and quickness of movement of his infantry enabled him to support his cavalry. Twenty-two guns were brought into action in a favourable position and the battalions took the combined infantry in flank. The allied troops were too slow to parry. The blow was powerful, as well as quick, and the allied army gave way and fled in confusion.—*Jomini.*

change of front position or formation of a large body which, if not practised to make such a change steadily within a given time, might be thrown into confusion if attacked even by a small body during the moments of transition.

3rd. Hesitation as to incurring the responsibility of acting without orders, and thus running the risk of throwing out the general plan, and the impossibility, in most cases, of the commander-in-chief being aware of what is going on at different points of the line of battle, combined with the slowness in the transmission of orders and possibility of their being misapprehended.

As to the first case, the data to form conclusions on the points mentioned might generally be best obtained by reconnoissance, patrols, and the effective performance of outpost duties; but there seems to have been a prejudice, particularly among some nations, against any preparation in these points, or any drill or training of the subordinates, without whose practised assistance it appears to me that much cannot be done. No one can read the few slight sketches I have given, and the history of modern battles, without being struck by the number of cases in which armies seem to have been taken by surprise, either wholly or partially. Cases will also be noticed in which such large numbers of troops have been employed to reconnoitre, that, besides incurring the risk of bringing on an action prematurely, the troops employed may be found detached at a time when their concentration may be peremptorily required. It is also stated on other occasions that reconnoissances were made by experienced officers, but apparently without good results, for the reports furnished were contrary to facts.*

* The Austrians, under the Marchal de Neupery, were actually surprised on the march, although it appears that several officers of hussars had been ordered to reconnoitre the country. The Marshal had no intimation of the approach of the enemy, till he saw the Prussian army *en bataille* in front of his cantonments, and was obliged to form his troops under the fire of the Prussian guns.—*Jomini.*

It seems to me that the conclusions to be arrived at with reference to these cases are, that if men, as well as officers, had been well trained and instructed in outpost duties, the surprises would not have occurred; that with proper instruction, a few practised men would have performed the duties of reconnoitring more advantageously than the large bodies employed, and that if the officers had been assisted by a sufficient number of men, who thoroughly knew their work, false reports would not have been made; but this is contrary to the generally received opinion, which I know is, that outpost duties are best learned on service, and that any previous instruction or any preparation would do more harm than good. I have even seen (in a military work) the surprise of a picquet accounted for by the fact, that the men had been over instructed in their duties, and the performance had become so much a matter of routine that when real work was to be done, they were careless and negligent.

But there is another reason (as stated in the second case) for vacillation at the critical moment when sudden action is required. To pass from the defensive to the offensive quickly and effectively, or to take advantage of an unexpected opportunity, by the movement of large bodies of troops within a certain time, requires a rapidity and precision of movement only to be acquired by training and practice. If a regiment or a single brigade can do steadily, in a few seconds, in the way of a change or formation, what it takes their opponents minutes to perform, the advantage gained will be obvious; but when we come to large bodies, which take a longer time to make corresponding changes, the advantages of rapid movement with steadiness are not at once so apparent. Nevertheless, a little consideration will show, that if we can do in a quarter of an hour what it takes our opponents half an hour to perform, and if at the end of that time we are in a

position for an immediate attack, the advantage gained is the same, though the movement is upon a larger scale.

Jomini, remarking upon the order and arrangement exhibited in the movements of Frederick's troops before and during the battles of Rasbach, Kollin, and Zeuthen, says:—"I conceive that in this I have discovered one of the principal means which enabled Frederick to move his troops in large bodies and bring them suddenly upon a flank of the enemy's line, to work in column, or to form with the rapidity of lightning; and this I consider to have been one of the principal causes of his success."

As we have seen in the preceding chapter, many changes have taken place since the time of Frederick the Great in the division and subdivision of armies, as well as in the modes of movement and formation, but the grand desideratum remains the same, namely, the power of changing front or direction, and moving rapidly from point to point in large bodies.

We have long since found that, in order to facilitate the movement of batteries, regiments, and battalions, we must subdivide them into half batteries, divisions, subdivisions; squadrons, troops, divisions; companies, divisions, sections, &c.

With reference to the cavalry and infantry, we have found the advantage and convenience of equalizing these subdivisions as much as possible, and consequently our drill for both arms is constructed accordingly. It may not be possible always, upon service, to attain to this exact equalization without a special arrangement; casualties or sickness may have weakened some companies or squadrons more than others, but the general principle of equalization is acknowledged and understood, and some contrivances generally hit upon to fulfil the requirements of equality in the subdivisions.

I should propose to carry this principle of equal subdivisions up to the larger bodies of troops, or rather to carry it down as much as possible from the army which takes the field under a commander-in-chief to act upon some portion of the theatre of war, to the smallest subdivision of the same army.

The principle once established, and the details worked out at camps of exercise and elsewhere, it seems to me that impromptu arrangements could always be made to carry it out, even when exposed to the difficulties of a campaign. This being admitted, I think that by applying the rules of drill in the details of manœuvre to divisions and brigades, with reference to the combined working of the three arms, in a higher degree than has been yet attempted, we shall arrive at a rapidity of movements, formations, and changes of front of large bodies, which would give at the present time the same superiority on the field of battle, which Alexander, Gustavus, Frederick, and Napoleon gained in their day, by the power of striking more rapidly than their opponents could parry.

Again, Jomini says, "Battalions are to larger bodies what pelotons (divisions) are to battalions, and should be moved and formed relatively according to the same principles."

The first point to be determined is in what should consist the subdivisions of an army. Going back to ancient times we find that as the leading principles of tactics in their simplest form have remained much the same for many ages, so also the organization of armies with reference to rudimental principles has not altered so much as might be supposed by those who have not studied the subject. So much has been written on the formation and armament of the Grecian and Roman armies, the subject has been so deeply considered by antiquarians, and is

generally so well known, that it would be absurd to give the matter in detail here. I shall therefore merely advert to it with reference to organization and formation, in order to show how much attention was paid to the equalization of the sub-divisions of an army, and to all details of organization, and also how little the ancient systems differ from the present in many essential points.

The first formation in phalanx that we hear of was that of the Lacedæmonians, or Spartans, which consisted of ranks of soldiers eight deep.

The Athenian phalanx was formed in the same manner up to the time of Miltiades, who increased the front by reducing the depth to four deep.

Epaminondas, one part of whose system was to force the lines of his adversaries with the impetus afforded by a deep formation, reduced the front and increased the depth to eight, ten, and twelve deep, and in some cases formed masses of much greater depth, and it was in accordance with this principle that he organised the Theban forces.

But it was in the time of Philip of Macedon (359 B.C.) that the Macedonian phalanx was organized, which may be taken as the best representative of the phalanx mode of formation.

A lochos was a certain number of men drawn up in what we should now call single file, one covering the other: this body, so formed, consisted at different times of different numbers—8, 10, 12, or 16 men. The phalanx was formed by placing the lochi alongside of each other, consequently the number of men in the single file or lochos was equivalent to the number of ranks in the phalanx.

Alexander is said to have appointed sixteen as the strength of the lochos, as being the best proportion with reference to the extent of front and depth of the phalanx: this depth also permitting the action of the missiles of the

archers and slingers stationed in rear of the phalanx. If phalanx was doubled to form a column, the depth me thirty-two ranks; and if the depth was reduced by nalf, in order to double the extent of front, the depth ıme eight ranks. If the depth had been eight, as in the tan phalanx, the depth in the last case of four ranks not in those days considered to be sufficient. For e reasons, sixteen was determined upon as the strength lochos.

The distance between files at open order was six feet; order, three feet; locked order, one-and-a-half feet. open order was for the march, close order for the k, and locked order to receive an attack.

In determining the depth of the phalanx, and con- ently the strength of the lochos, it was necessary, r, to take into consideration the matter of armament. he sarissa, the Macedonian pike or lance, was first ted under Philip of Macedon; it was used by the infantry, and also by particular regiments of cavalry. The sarissaphori, or lancers, formed a body of light cavalry, carrying a long lance. The heavy cavalry were armed with the xyston, or short pike. The cavalry sarissa was fourteen feet long; the infantry sarissa, not less than twenty-one and sometimes twenty-four feet long.

The infantry sarissa, when in a horizontal position, was held with both hands; taking the sarissa at twenty-one feet, it projected fifteen feet in front of the body of the pikeman, the hinder portion of six feet being weighted, to balance it. Therefore, taking the distance of files at three feet, the spear of the second rank man projected twelve feet in front of the first rank, that of the third rank man nine feet, that of the fourth rank man six feet, and that of the fifth rank man three feet; the ranks behind the fifth slanted the sarissa over the shoulders of those in front, as

a defence against missiles. Therefore, when the depth was reduced by one-half, in order to double the front, the strength of the lochos being sixteen, five spears were levelled and three slanted. These different matters being taken into consideration, the strength of the lochos was fixed at sixteen men.

The man at the head of the lochos, or, as we should call it, the leading file, was called the lochagos or protostate; the second man was called epistate; the third, as well as the first, was called protostate; the fourth, epistate; and so on alternately to the last file or serrefile, who was called the ouragos. The first and last were generally picked men.

The junction of two or more lochi was called syllochism; it was effected by placing the prostates and epistates of the one alongside the prostates and epistates of the other. One man, considered with reference to his juxta position with another, was called parastate.

The junction of all the files formed the phalanx, of which therefore the lochagi or leading files formed the front rank, and the remaining parastates, as far as the ouragi or serrefiles, the depth.

The principle of the phalanx formation was that, from first to last, every combination should be divisible into two equal parts. It was as follows:—

Phalanx.

16	file	1	lochos.
2	lochi . . .	1	dilochie.
2	dilochie . . .	1	tetrarchie.
2	tetrarchies . .	1	taxiarch.
2	taxiarches . .	1	syntagma.*
2	syntagmata . . .	1	pentecosiarchie.

* The syntagma formed a square 16 front and depth—256 men.

2 penticosiarchies . 1 chiliarchie.
2 chiliarchies . . 1 merarchie.
2 merarchies . . 1 phalanx.
256 lochi = 4,096 men.

Commanded by a general or phalangarch. Attached ch syntagma were 5 supernumeraries—

1 ensign.
1 rear man.
1 trumpeter.
1 herald.
1 orderly.

5

The half of this number was considered sufficient for light troops, and the fourth for cavalry.

The phalanx was not adapted to act alone, it was unprotected in flank and rear, and unfitted for changing front, &c., or for acting upon uneven ground; but we are told that changes of front in phalanx formation were effected, close column of syntagmata formed, and other movements performed.

The hypaspists were light infantry (shield bearers or guards originally employed for the personal defence of the Prince) armed with a shield and one-handed pike; they occupied a middle place between the heavy infantry of the phalanx and the peltasts, or light troops generally; besides these, numbers of irregular troops were employed.

The heavy cavalry were called companions; the light cavalry, sarissaphori. At the accession of Alexander the cavalry were divided into squadrons. He afterwards divided each squadron into two lochi.

The organization of the larger bodies of troops was as ollows:—

2 phalanges . . .	1 diphalangarchie.
2 diphalangarchies .	1 tetraphangarchie, or grand phalanx.

Phalanx	4,096
	2
Diphalangarchie .	8,192
	2
Grand phalanx . .	16,384

We find from Niebuhr that the phalanx was the form in which the Roman armies were originally drawn up. Subsequently the legionary formation was adopted. The legion appears to have first consisted of 3,000 foot and 300 horse; it was afterwards augmented to 4,000, and then to 4,500. This was the number in the time of Polybius; in the time of Maulius it rose to 6,000.

The fundamental and hereditary principle in the Roman system of organization, which seems to have descended from the earlier to the latter times, was the formation in lines of ten ranks deep. Any change in the strength of the lochos, the smallest unit in the Greek formation, affected the depth of the phalanx; but any change in the strength of the century the unit in the Roman formation would only affect the extent of frontage of the lines so long as the depth of ranks remained constant.

The strength of the century seems to have been at different times 30, 60, 75 and 100 men. The legion was originally drawn up in battle array in three lines, composed of three different descriptions of soldiers, termed respectively hastati, principes, and triarii, and the organization of the Roman legion, like that of the Greek phalanx, was modified according to the armament of the men who composed it. The offensive weapons of the hastati and

principes were two barbed iron-headed javelins, one of which was hurled at the enemy on the first onslaught, while the other was retained as a defence against cavalry, &c. T e light-armed hastati retained only the knife, while the ncipes and heavy-armed hastati were armed with raight two-edged blades. We are told that the Romans variably gave point and derided those who depended upon the cut. The triarii were armed with the pilum, a strong pike, and a sword. The light troops were armed ith a sword and javelin, the point of which was so fine at when it struck it became blunted and unfit to be re-urned.

The defensive armour of the heavy armed troops nsisted of a casque or helmet of brass, with a red or ack plume, a breast plate, an iron-bound boot for the ht leg and a cylindrical shield, four feet long by two and a nalf broad, covered with linen cloth and then with calf skin, bound at top and bottom with iron, the centre also being defended by a plate of the same metal. The light troops carried no defensive armour, with the exception of a casque without a plume, and a round shield of three feet in diameter.

The hastati and principes were called antipilani, or antesignani, because they were drawn up in front of the triarii, who carried the standards, and who were also called pilani.

At the beginning of the fifth century B.C., the organisation was as follows:—

30 men	. . . .	1 century,
2 centuries	. . .	1 manipule,
15 manipules	. . .	1 line,

making the line 900 men, and the legion was thus formed in lines:—

Hastati . . .	600	
Principes . . .	900	
Triarii . . .	900	
	2,400	heavy-armed troops of the line.
Light-armed hastati .	300	
Rorarians . . .	900	
	1,200	light-armed men.
Heavy-armed men .	2,400	
Light-armed men .	1,200	
	3,600	
Accensi . . .	900	
	4,500	

Which was then the strength of the legion.

If the troops were uniformly armed, a century of 30 men 10 deep stood with 3 men in front, but if half of the force only were made up of men fully armed, it became necessary to form each century of double the front and half the depth, that is, six in front and 5 in depth, so that the half armed should be stationed behind the men in full armour, in the sixth and following ranks.

The number of the light infantry (1,200) was half that of the other troops (2,400), which agreed with the system of the Greeks. The accensi stood apart from the century, their business being to take the places and arms of the killed and missing. It was the duty of the rorarians to open the battle together with the light armed hastati, who afterwards withdrew behind the lines. The light infantry, known at first under the names of rorarii and accensi, were afterwards called velites, and ultimately ferentarii.

In the time of the republic (510-471 B.C.), we find the following organisation of the legion:—

60 men	1 century,
2 centuries . . .	1 manipule,
10 manipules . . .	1 line of 1,200 men,

distributed thus:—

Hastati . . .	1,200
Principes . .	1,200
Velites . . .	1,200
Triarii . . .	600
Equites . . .	300
	4,500

The hastati, principes and triarii formed three separate lines, each divided into 10 manipules of 120 men each in the case of the first two lines, and of 60 men in the triarii.

The manipule of 120 men was commanded by a centurion, who had a second centurion and two sub-officers under him. There was also a decanus in command of every squad or tent of 10 men. The senior centurion of each line commanded that line. The principalus or senior centurion commanded the legion in the absence of the tribunes. The staff of the legion was composed of six tribunes, who managed the paying, quartering, and provisioning of the legion in turns, for a period each of two months. This changing command lasted till the times of the civil wars.

The 300 cavalry formed a regiment of 10 turmæ or troops, of 30 horsemen each, under 3 decurians, of whom the senior had the command. The turmæ consisted of 3 decuriæ of 10 men each.

After the time of Marius (157-86 B.C.) The legion was at first divided into three large bodies of about 1,600

each, including the velites, but such bodies were found too numerous to work under a single commander.

The three lines were then assimilated, and the legion was divided as follows:—

75 men	1 century,
2 centuries	1 manipule,
3 manipules . . .	1 cohort,
10 cohorts	1 legion,

making the legion 4,500 men.

Afterwards the centuries were augmented to 100 men, and consequently the organization was as follows:—

100 men	1 century,
2 centuries	1 manipule,
3 manipules	1 cohort,
10 cohorts	1 legion,

making the legion 6,000 men.

In the imperial times the cavalry troops or turmæ consisted of 32 men, 33 including the decurian. The cavalry of the legion consisted of ten squadrons; the first squadron was attached to the first cohort, and was composed of 4 turmæ; the remaining nine squadrons of 2 turmæ each, forming in all a regiment of 726 horse.

It is supposed that when the legionary cavalry was augmented the number of turmæ were increased.

As to the movements of the legion in the field.

In the earlier times one of the most usual formations on the field of battle was the following:—

The hastati were formed in line of manipules, the interval between each manipule being equal to the extent of front of the manipule.

Taking the manipule at 120 men, the manipule would be ranged ten deep upon a front of twelve men; and as in those times each soldier was supposed to occupy three feet, the extent of front would be twelve yards.

Since the first line consisted of ten manipules, it contained nine intervals of twelve yards.

Opposite to which, in the second line, were posted nine the ten manipules of the second line, or principes, wn up in the same manner as those of the first, the h manipule outflanking the right or left flank of the tati; or, in other words, they took the modern formation called "Tant plein que vide."

The triarii, in less depth than the hastati and principes, cupied the third line generally in continuous formation. e principes could form line with the hastati, by advancing into the intervals of the first line; by moving the anipules of the principes twelve yards to the right or ft, and then closing up, the depth of the formation of the st two lines was doubled; and if the manipules of the rii were then brought up in rear of those of the cipes, the whole force was formed into what we should w call contiguous columns, the intervals being equal to e fronts of columns, instead of only five yards. This formation was taken when menaced by elephants.

Three continuous lines could be formed by closing the intervals of the hastati and principes.

At a later period the Romans adopted another system, distinguished for its solidity, compactness, and the facility and rapidity with which the formation for attack might be taken from the order of march.

Each manipule of the legion formed only a single rank; therefore the hastati and principes, consisting of ten manipules respectively ranged each upon its first manipule, formed two lines ten deep, with a frontage equal to the extent of front of the manipule. Each man was supposed to occupy three feet every way. The lines were separated by a distance equal to half the extent of front.

At an equal distance in rear of the principes, the triarii

formed a third line or reserve; in this formation, the whole constituted a square as deep as it was broad.

The legionary cavalry formed on the flanks. The eagle was carried on the right of the triarii. Such was the formation of each legion.

The different legions composing an army were ranged upon the same principle, each legion making one of the ranks of a general column, the baggage occupying the intervals, while the velites acted upon the flanks.

If the enemy threatened the front, each legion in succession formed line with the head of the column.

If the force consisted of four legions, the whole was formed in about seven minutes.

If the flank was threatened, the baggage withdrew from between the legions to the side opposite the enemy. Each legion executed a change of front, right or left, upon the hastati, and then formed in order of battle.

This manœuvre is supposed to have been executed in two minutes.

We shall now take two instances of modern organization, and I think a comparison with those just given will show how little the general principles have varied during the many ages which have passed since armies were first systematically formed.

In the Prussian infantry service the formation in three ranks is still retained, but the exchange of weapons between the second and third ranks, formerly practised, was done away with upon the breach-loader being introduced. The fire from the formed ranks is either from the first or second rank alone, or else together in volley firing. In file firing the front-rank man presents, takes as good an aim as he can, fires, loads quickly, but without hurry, and makes ready; his coverer in the second rank then presents, fires, and loads in the same manner; when faced about the third rank acts as the first, &c.

In battalion skirmishing, a division of two ranks deep is formed from the third rank of each company.

If the third rank are out skirmishing when the attack with the bayonet is made, they protect the flanks and pursue when the attack is over.

The company is formed in three ranks, the tallest men in the first rank, the best shots in the third; the rifle companies in two ranks; distance between ranks, two feet.

Three men or two covering each other form a file (rotten).

The company is divided into two equal divisions (züge).

If over twenty file they are again sub-divided into half divisions (halb-züge), and then again into sections.

If of nineteen file, or under, they are at once divided into sections. The sections never to be over six or under four file.

The company (kompagnie), which may be considered as equivalent to our English grand divisions, is rated at the peace strength at 144 men, and at the war strength at 216.

Taking the company at the former strength, the organization would be as follows:—

3 men	. . .	1 rotten,
6 rotten	. . .	1 section,
2 sections	. .	1 halb-zug,
2 halb-zug	. .	1 zug,
2 züge	. . .	1 kompagnie of 144 men;

and at the latter—

3 men	. . .	1 rotten,
6 rotten	. . .	1 section,
3 sections	. .	1 halb-zug,
2 halb-zug	. .	1 zug,
2 züge	. . .	1 kompagnie of 216 men.

The organization of the larger bodies is as follows:—

4 kompagnies	. . .	1 battalion,
3 battalions	. . . .	1 regiment,
2 regiments	. . . .	1 brigade,
2 brigades	. . . .	1 division,
2 divisions	. . . .	1 corps d'armée,

which, taking the strength at the war rate, would be as follows:—

Battalion	864
Regiment	2,592
Brigade	5,184
Division	10,368
Corps d'armée . .	20,736

Taking the section at the lowest (four file) we have the following, which will give the company at a strength between the peace and war establishment:—

3 men	. . .	1 rotten,
4 rotten	. . .	1 section,
2 sections	. .	1 halb-zug,
2 halb-zug	. .	1 zug,
2 züge	. . .	1 kompagnie of 192 men.

In comparing the ancient with the modern organization, I shall adopt this strength.

In the French infantry service the company is formed in two ranks, sized from flank to flank, the two tallest men of the company form the first file, the next in height the second, and so on to the last file, which is formed of the smallest men in the company; distance between ranks thirty-three centimetres (a little more than a foot), measured from the breast of the man in the rear rank to the back of the man in the front rank, or to the haversack when in marching order. Each company forms a peloton in line,

and when parading for field exercise the pelotons are equalized by shifting, if necessary, one or two files from one company to another.

In consequence of experiments made at the camps of exercise at Châlons, the intervals between battalions, regiments, and brigades in line, have been augmented with a view to facilitate the passage of cavalry and artillery to the front. The intervals between battalions in line are now fixed at twenty mètres (thirty paces), more than twenty-six of our paces of thirty inches. Between regiments in brigade thirty mètres (forty-five paces), and between brigades forty mètres (sixty paces), about forty and fifty-two of our paces respectively.

The distances between battalions in column have also been augmented. There was formerly only a distance of nine paces between battalion columns in mass, and of a sub-division when at half distance, in order to gain time in deployments and formations, and to facilitate the movements in general. The formation of column of battalions in mass at a distance of the front and a half of a sub-division has been adopted.

The battalion fires by peloton, demi-battalion, battalion, by both ranks, and by ranks. When both ranks fire together the right file fires first, the next file on the left does not present until the first file has come to the loading position, and so on in succession to the left for the first fire; afterwards each man loads and fires independently.

In the fire by ranks the men of the rear rank carry the right foot obliquely to the right, close to the left heel of the men on the right of their front rank men, make ready, and fire by word of command; the front rank make ready without moving the foot, and also fire by word of command. Taking the regiment at three battalions and the

corps d'armée at two divisions, the general system of the French organization is as follows:—

2 demi-sections	. .	1 section,
2 sections	. .	1 peloton,
2 pelotons	. .	1 division,
2 divisions	. .	1 demi-battalion,
2 demi-battalions	.	1 battalion,
3 battalions	. .	1 regiment,
2 regiments	. .	1 brigade,
2 brigades	. .	1 division,
2 divisions	. .	1 *corps d'armée.*

Taking the demi-section at twelve file, which gives forty-eight file (96 men) for the strength of the company, we obtain a strength of 768 men for each battalion, and I shall adopt this strength in making the comparison between the ancient and modern systems of organization, which will be found in the following table:—

The numerical strength of the component parts of an army has varied under different circumstances, both in ancient and modern times; but I have taken a sufficiently close approximation to the average to warrant a comparison, and I think an inspection of the table will lead to the conclusion that the general system of organization has not varied so much even from the earliest times as might have been expected.

Four legions were generally raised at a time during one period of the Roman dynasty. I have therefore considered this aggregate as an equivalent to our present *corps d'armée* as well as the grand phalanx of the Grecians.

Greek.	Roman.	Prussian.	French.
Lachos, 16.	—	Section, 24.	Demi-Section, 24.
Dilochie, 32.	—	Halb-Zug, 48.	Section, 48.
Tetrarchie, 64.	Century, 75.	Zug, 96.	Peloton, 96.
Taxiarch, 128.	Manipule, 150.	Kompagnie, 192.	Division, 192.
Syntagma, 256.	—	Demi-Bataillon, 384.	Demi-Bataillon, 384.
Penticosiarchie, 512.	Cohort, 450.	Bataillon, 768.	Bataillon, 768.
Merarchie, 2,048.	—	Regiment, 2,304.	Regiment, 2,304.
Phalanx, 4,096.	Legion, 4,500.	Brigade, 4,608.	Brigade, 4,608.
Dephalangarchie, 8,192.	—	Division, 9,216.	Division, 9,216.
Grand phalanx, 16,384.	4 legions, 18,000.	Corps d'Armée, 18,432.	Corps d'Armée, 18,432.

Systems of organization have been proposed at different times by those who have written on the subject.

Although the sub-divisions of an army into corps d'armée, divisions, and brigades, had been adopted into the Prussian service, Decker deprecates the sub-division of divisions into brigades, and advocates the adoption of divisions of nine battalions each. His opinion is, that brigades are useful in time of peace for the instruction of officers, but that on service they become embarrassing.

He forms his corps d'armée of four divisions of nine battalions each; one division as advanced guard, another as reserve, the remaining two forming the main body. Two squadrons of cavalry to each division. The two squadrons of the reserve forming, with the advanced guard, one additional regiment of cavalry (four squadrons), to be also attached to the advanced guard.

Five regiments of cavalry (twenty squadrons) in reserve.

The artillery of the advanced guard (besides a battery of field artillery which is supposed to be attached to each division) is formed of a half-battery of heavy artillery or a half-battery of horse artillery, according to circumstances. The artillery with the main body is formed of the divisional artillery. The artillery reserve is formed as follows:—Three heavy batteries, two field batteries, one battery of horse artillery, one battery of howitzers. The artillery of the infantry reserve forms also with the artillery reserve. Two batteries of horse artillery are attached to the cavalry reserve, detaching one half battery to the advanced guard. A formation very nearly analagous to this is stated to have been adopted in the Prussian service from 1813 to 1815. Taubert puts the reserve artillery of a *corps d'armée* at three 12-pounder batteries to each infantry division, consisting of twelve battalions, and one cavalry regiment.

Colonel Hamley in his work (on the operations of war)

gives us an ideal or abstract line of battle, not to be rigidly or pedantically adhered to, but in point of fact, a mode of subdividing an army to which, on service, we should approximate as closely as circumstances might permit. Colonel Hamley supposes an army to be divided into five divisions of infantry, each division into two brigades, each brigade into six battalions of 800 strong, which gives 9,600 for the strength of the division.

A corps of cavalry of ten regiments, each regiment of six squadrons of 96, about one-sixth of the total force. Two batteries to each division, each battery of six guns, two troops of horse artillery to each wing of the cavalry, and a reserve of three troops of horse artillery; three field batteries and two heavy batteries, besides the field batteries of the infantry held in reserve, which will give a total force (placing the heavy batteries at four guns each instead of six) of one hundred and twenty-eight guns, or about two and a quarter guns per thousand men. He places his force in two lines with a division of infantry in reserve, and one battalion of each brigade of the first line, together with some light infantry battalions as skirmishers. He places the divisional batteries in the intervals between brigades and six squadrons in rear of the centre; twenty-four squadrons on each flank of the line; five regiments of cavalry with the reserve. This is an outline of the arrangements proposed. The Prussian *corps d'armée*, in 1866, was composed of two divisions of two brigades each, each brigade formed of two regiments of three battalions each. To each division was attached a regiment of cavalry. One corps of cavalry was formed of five regiments of cuirassiers, four of lancers, four of dragoons, and two of hussars. The Austrian army was formed previous to the campaign of 1866, in *corps d'armées*, each of which was composed of four brigades. The light cavalry divisions

were composed thus:—The first of three brigades, the second of two brigades; the brigades of two regiments each, and a battery of horse artillery. The divisions of the cavalry of reserve were composed, each of two brigades of three regiments each, and a battery of horse artillery. These corps were newly formed, for in time of peace the Austrian formation was in brigades—a brigade consisting of two regiments of three battalions and one light battalion. To each was attached a squadron of cavalry and a battery of four guns.

In the French army each division consists generally of two brigades, one of which contains two regiments of the line of three battalions each; the other has two regiments of the line and one battalion of chasseurs. Three batteries of artillery belong to each infantry division and manœuvre with it. According to the "Ordonnance de la Cavalerie," the cavalry division consists of two brigades, each brigade of two regiments of six squadrons each. Each squadron strength, 96. At Solferino the French brigades were of eight squadrons.

Other arrangements and sub-divisions adopted at different times might be mentioned, but it will be seen that essentially the difference is not very great. A body of troops of a certain strength may be called a division in one service and a brigade in another; these again may be formed in larger bodies, called divisions, the aggregate of which may be called a *corps d'armée*, or the *corps d'armée* may be simply divided into divisions; the divisions or brigades differing more in name than in strength. The decision as to which of these is the best arrangement, or whether any other better than these might be adopted, will, of course, remain in the hands of those who have the control over such matters and who are most competent to decide; but in order to explain the nature of the system of

drill for the three arms combined in large bodies, which I am about to propose, it is necessary that I should assume, at least, an approximate strength for the manœuvring bodies to be considered as units in the movements indicated; I have accordingly, as nearly as possible, adopted the system proposed by Colonel Hamley—infantry brigades of six battalions of 800 each, two brigades forming a division; and cavalry regiments of six squadrons of 96, forming two such regiments into a brigade, and two brigades into a division.

But any one, who will take the trouble to study it, will find that the system might be made equally applicable to any other arrangement, and that a sufficient margin is left for all changes of strength which might occur on service or otherwise.

I have given the details of the advance, retreat, formations and change of front, of the brigade or division, the three arms working in combination; and the time occupied in the different movements. I have made allowances for the movements being performed upon average ground in which obstacles may necessitate a partial formation in column, or may temporarily retard the movements of the artillery. It seems to be generally recommended that brigades when acting in division should be formed in two lines adjoining by the inward flanks, as by this means the brigade command is in depth and not in breadth, and the second line of each brigade would relieve the first line of the same brigade, instead of one brigade of a division relieving the other. But under the supposition which I have made as to strength, whether the division was formed thus or with one brigade in first line, and the other in second, the frontage of the infantry division would equal that of six battalions deployed in columns at deploying distance, or in contiguous columns, and the frontage of the

cavalry division would equal two regiments (six squadrons each) deployed in columns at deploying distance, or in contiguous columns. I have supposed two field batteries to be attached to each infantry division, and two batteries of horse artillery to each cavalry division; but it will be seen that the movements are equally adapted to any strength of artillery and to any position of the artillery, whether massed on one flank or formed on both.

In Taubert's work on "The use of Field Artillery on Service," we find, "The principle of modern field tactics essentially consists in the reciprocal support of the different arms, and in the seasonable employment of the reserve." The reserve artillery is an important element of the reserve, and from the nature of its duties should be attached to it. Its object, consequently, will be twofold—to support the divisional artillery in action by detached batteries, and to bring matters to a decision by uniting the batteries of the reserve still available, in conjunction with the infantry and cavalry of reserve.

It will be found that the proposed combined movements are particularly applicable to the two cases mentioned above. A force advancing to the attack (whether a portion of the general reserve or otherwise) may have in the present time to encounter the fire of artillery in position on the line of battle, or of masses of artillery which may have been moved, strongly escorted, to commanding ground, as well as the fire of small arms when arrived within their range. It was anticipated that the improvements in the artillery and small arms would greatly increase the amount of casualties on the field of battle, but experience in the late wars has rather tended to prove the contrary.

In order to diminish the effect which might be produced by such fire, the movements are constructed with a view to enabling the advancing line to carry with them the effect

of the fire of the artillery and small arms to the last moment preceding the assault, and that without halting, and thus affording a standing mark to the enemy's artillery. Such an advance would, of course, be prepared as usual, by a fire from the heavy batteries and other artillery in position, and protected, if circumstances should permit, by the fire from masses of artillery which may have moved under escort to favourable positions. The rapid fire and long range of the breech-loading rifle would enable us to continue the infantry fire during the advance or retreat, by adopting a movement all the details of which are described in the introductory chapter and given in the drill. The calculations on which they are founded will be found in the Appendix by anyone who cares to refer to them. This course has been adopted with all the movements which I have indicated.

The mode I should propose for forming the cavalry on a moving base from small columns which could pass through ravines from the covered ground to the open, or round the flanks, or through the intervals of the infantry, and the mode of combining the movements with the horse artillery, will be found described in the following chapters.

A military correspondent, writing lately to the *Times* from the camp at Chalons, says, "Squares are still retained in the French service, though acknowledged to be almost unnecessary. Now that the fire of infantry is so terrible, cavalry will never be rash enough to attack battalions of the line so long as they are steady and unbroken by the fire of artillery. Infantry should always beat off cavalry alone; and in case of cavalry and artillery manœuvring together against infantry, no formation of the enemy will give the gunners so good a chance as that of squares."*

* *Note by Colonel Hamley.*—It appears to me that cavalry by *dividing* and threatening infantry on several sides can always compel it to form squares.

As to the changes of front, it will be evident that if we change front forward or back rapidly with a brigade protected by the action of artillery, we can do the same with two brigades by making the change on the centre, throwing one brigade forward and the other back, protecting the movement by a body of cavalry supported by horse artillery, while the change of the rest of the force is effected by a movement described by Colonel Hamley, in his work on the "Operations of War," page 313.

COMBINED MOVEMENTS OF THE THREE ARMS.

The movements of all bodies of troops, whether great or small, may be resolved into the following:—

I. Movements *en bataille*, or fighting order.

II. Movements in a column formation suited to the exigencies of the march—the passage through narrow roads and accidented ground, or to the movement of bodies of troops from point to point on the field of battle.

III. The passage from one order to the other.

Under the head of movements *en bataille* or fighting order, are generally included the advance and retreat of the line in lines deployed or in line of columns, whether by alternates bodies or otherwise.

Movements in echellon and changes of front or position, during which the body effecting the change shall be ready at any moment during the movement to assume the order *en bataille* and act offensively, or in which the body performing the change by means of the column formation shall be protected by a body effecting the movement as first described, or else by a body already formed *en bataille.* The movements in a column formation include movements by columns of route, and by all column forma-

tions facilitating the movement of troops from one point to another in the field.

1. Movements *(en Bataille)*, Advance and Retreat of the Line.

The great military problem to be solved in the present day seems to be the following:—How is the advance previous to the assault or attack to be effected? It seems to be generally admitted, that with reference to arms of precision the old system will not do. What that system was, is so familiar to every one acquainted with military subjects that I shall not enter upon it here. It was founded upon certain combinations which no longer exist in practice, and, consequently it is no longer applicable.

But the question which seems now to have arisen is, what are we to substitute for the old system in order to meet the exigencies of modern improvements. As to the purely defensive action of armies in the field, so long as they can remain in the position first occupied, nothing need be said. Modern improvement seems to have so far strengthened the defence that the attack of an army in position, unless under some very favourable circumstances of ground or otherwise, seems at first sight to have become almost an impossibility. But past and recent experience has taught us, that however strong in position an army may be, strength of position alone and defensive action, even with all the appliances of modern times, will not avail against an attacking army superior in power of manœuvring and rapidity of movement. But the difficulties of the attack are so enhanced by the improvements in the action of artillery and small arms, that in the *Ordonnance Royale* for the grand manœuvres of the Prussian army, in June, 1861, we find the following:—"No resource now

remains for the attacking force but to avoid the open plain, and, if possible, obtain protection during the advance from broken or undulating ground, or else attack at the close of day or during the night. Anything like an attack upon a grand scale, in which the force of the three arms may be effectually developed and brought to bear, requires ground, to a certain extent, open. If the covered ground extends up to the enemy's position, the attacking and defending forces become more upon an equality, or it may be that the superiority may be on the side of the attacking force; but that is not the question we have to deal with at present. The enemy will most likely have taken up a position with open ground in front, over which their artillery and small arms will have full effect against the attacking force with well-known points marked at the different ranges." The question is, how is such a position to be attacked? What we have to contend against is the long range and fatal accuracy of the enemy's artillery, the increased range, precision and rapidity of fire of the small arms. The consequences are, that we must form within range, or else be so far off when formed as to render the attack ineffective. During the advance, also, we shall be subjected to the effective action of both artillery and small arms at distances within which we should formerly have been comparatively safe. The number of shots from the small arms also, when once the attacking force has arrived within their range, will be as five or six to one of what it was in former times.

The question is—How is all this to be met? and in order to find an answer, we must, in the first place, consider what are the weak points in the great power opposed to us, and what favourable elements exist which may be turned to our advantage. Under the first head, we may consider the following:—

The accuracy of both artillery and small arms at long range on the practice ground at a fixed mark appears almost marvellous. But this accuracy diminishes considerably on the field of battle under all the casualties of action, these have been so often enumerated by those who have lately written upon the subject, that it is needless I should recapitulate them here, except the following, which I consider the most important.

Having, instead of the standing mark to which they have been accustomed on the practice ground (or what is nearly the some thing), a mark passing backwards and forwards upon a line perpendicular or nearly so to the produced axis of the arm in action, the moving mark afforded by constantly advancing bodies of troops allowing no time for a trial-shot and rectification, if the first estimate of the distance has been incorrect, as far as the artillery are concerned and as far as small arms are concerned, producing a confusion and uncertainty which is fatal to accurate firing at long range. Also, the longer the range the shorter the dangerous distance to be passed over; besides which, if the cavalry and artillery of the attacking force have the power of moving rapidly, and the ground is favourable, the enemy's artillery in position may be taken *en rouage* at long range, as was done at Magenta and Solferino. The difference of ranges are known to the advancing artillery, while they can be only estimated by the artillery in position. All these points are in our favour; but we must possess the power which simplicity, steadiness, and true rapidity in our movements would give us, in order to take advantage of them. And we must not only be prepared to take advantage of all the weak and assailable points in the power opposed to us, but we must also bring to our assistance and support all the power at our own disposal, even to making use of the continuous

action on the move and during the advance of the same improved weapons, which we may find ranged against us in fixed positions. According to our present arrangements our artillery must halt to unlimber before coming into action and opening fire. They must also limber up, after they cease firing, before continuing the advance or retreat, in concert with the other arms of the service. If, therefore, we should wish to avail ourselves of the action of the artillery while advancing to the attack over open ground, time must be allowed for both these movements. It must be evident that this can only be done by the artillery moving at a faster pace than the other advancing or retiring troops, and taking up consecutive positions at certain fixed distances. It may be said that this is a very simple matter, attended with no difficulty, and that it has been done habitually both on the exercise ground and in action. There is no doubt that the advance of an attacking force of either or both the other arms of the service has been habitually protected and supported by the action of the artillery; first, by the fire of artillery previous to the advance, so as to cripple the action of the enemy's artillery, partially silence his guns, and diminish the effect of his batteries during the subsequent advance of the attacking force. One position, or perhaps even more, have sometimes been taken up on favourable points of ground by the artillery during the actual movement in advance of the other troops. An instance in illustration of this, which occurred during the Punjaub campaigns, was related to me by a general officer who was present. It was to the following effect:—It fell to the lot of some infantry regiments and two or more batteries of guns to attack the enemy in position. According to custom, the attack was commenced by the fire of artillery, in order to prepare the way for the subsequent advance of the infantry. When a certain effect

was produced, the Commandant of the infantry, addressing the officers of the artillery, said—"Now you have done your work, it is time for us to do ours;" but the reply was, "Not yet; we will give them a little more of it before we let you at them." And accordingly, while the infantry were advancing, the artillery galloped to the front, took up a second position, and thus materially assisted the attack.

Other instances of this kind have no doubt often occurred. This action of the artillery, in successive positions during the advance of the other troops, was recommended by Colonel C. de Decker, of the Prussian artillery, more than forty years ago, and also by others who have written upon the subject; but they do not give us the details of execution, and it seems to me that these details are just what we want to know; for, if the artillery take up positions too far from the other troops, they run the risk of being compromised; and, on the other hand, if the successive positions are too close together, the fire of the artillery will become masked by the advancing or retiring force before any effective action can take place. Cases might be mentioned when the artillery fired over the heads of the advancing lines, and in the later wars positions have been taken up by large masses of artillery, protected by a strong force of cavalry, which moving rapidly to their ground, and taking advantage of the long range of the present day, supported the attack of the advancing forces; but, in addition to this available action of the artillery, which will, of course, be employed as heretofore as circumstances may dictate or permit, I should propose a closer and more intimate combination of the action of the improved arms of the artillery and infantry with the movements of the troops during the actual advance, so that there shall be no cessation of the artillery fire up to about 400 or 500 yards, and only a temporary one

of a second or two of the small arms till the moment for delivering the assault with sabre or bayonet has arrived, when the attacking line will pass forward to the charge, the artillery, forming under the protection of their escort, with the support or otherwise, as may have been previously arranged and determined, upon arriving within the prescribed distance. Even the smoke of this continuous action of artillery and small arms during the advance, may be of use in masking our movements and intentions from the enemy.

The weak moments of the cavalry are while they are advancing over the open ground to the attack, within range of the enemy's firearms, but not yet arrived within attacking distance. The weak moments of the infantry are while they are advancing *en bataille* to the assault, being unable to reply by the fire of their own rifles to that of the enemy. The weak moments of the artillery are while they are in the act of limbering up and coming into action exposed to the enemy's fire without the power of reply. But the combination of the arms during the advance gives us the power to a certain extent of counterbalancing the disadvantages resulting from this temporary weakness in each arm. In order to this, the continuous action of the artillery should protect the advance or retreat of cavalry or infantry up to or from the point mentioned. The cavalry or infantry should be at all times sufficiently close at hand to protect the artillery from a sudden and unexpected attack; and the fire of one portion of the artillery should protect the other portion when not in action. Therefore, the following conditions should be fulfilled. The artillery must take up successive positions so that the coming into action or limbering up of the artillery in the advanced position shall be protected by the fire of artillery in the rear position. The movement of the

troops must be so arranged, that in the advance, the fire of the artillery in action shall not be masked by the advancing line of our own troops before this purpose is effected, and that in retiring, the artillery in the rear position shall not be unmasked till the battery is in action ready to protect the limbering up of the advanced battery. If we take the simplest case, and suppose two bodies of artillery (say two batteries) working with a body of troops, either cavalry or infantry, one on each flank, it will be evident that while the body of troops passes over the distance between the consecutive positions of the artillery, during which time one battery remains in action, the other battery must limber up, pass over double that distance and come into action. The distance between the successive positions of the artillery, and, consequently, the maximum distance of the artillery from the advancing or retiring line of cavalry or infantry, varies directly with the velocity or rate of pace of the advancing or retiring line, also directly with the time occupied in limbering up and coming into action, and inversely with the velocity at which the artillery moves from position to position.* Therefore, if we could diminish the time occupied by the artillery in limbering up and coming into action, we could proportionately diminish the distance between the successive positions of the batteries. Also, as we increase the velocity of the cavalry or infantry during the advance or retreat, we must proportionately increase the distance between the positions of the artillery, and *vice versa.* And lastly, the greater the velocity of the artillery in passing from position to position, the less need be the distance between them. As to the time occupied in limbering up and coming into action, I have found by many experiments that, as matters now stand, thirty seconds for each, one minute for both, is sufficient; these movements,

* Appendix (Note 1).

particularly the latter, must not be hurried, as sufficient time should be allowed for laying the guns. Allowing, therefore, one minute for limbering up and coming into action, taking the pace of the cavalry at the minimum (the walk), and the velocity of the horse artillery at 16 miles an hour, the distance between the consecutive positions of the artillery will be 240 yards; this would allow of the artillery remaining in action 120 seconds in each position. Taking the pace of the infantry at the minimum (for field movements the quick-time), and the velocity of the field batteries at about 12 miles an hour, the distance between the consecutive positions of the artillery will be 180 yards. This would also allow of the artillery remaining in action 120 seconds in each position.*

These distances are also evidently the maximum distances which the artillery are from the cavalry or infantry. These distances gradually diminish as the line approaches each position; still, it would be desirable to reduce them, if possible, but this cannot be accomplished till we can either increase the velocity of the artillery or else reduce the time occupied in limbering up or coming into action, for we cannot reduce the velocity of the cavalry or infantry lower than the walk or the quick time, nor would it be desirable to do so if we could. As the matter now stands, if the principle of supporting the attack by the continuous fire of artillery in successive positions should be employed, the artillery must be protected during the advance or retreat by strong escorts of cavalry, or when the artillery is working with the infantry, at the walk by escorts of infantry, or cavalry as circumstances may require. So long as the distance between our own force and the advanced position of the artillery is less than the distance between the enemy's force and the same point, we may fairly consider our artillery under the protection of our main body

* Appendix (Notes 1 and 6).

from any sudden attack; and it must be recollected that the emergency we are providing for is the advance of the cavalry or infantry force over ground within range but out of charging distance, and if the latter is the case with regard to our own force it must also be the case with respect to the enemy. Even, upon the supposition that the artillery are suddenly attacked at the first moment of coming into action in the advanced position, when the cavalry or infantry line is at the maximum distance, 240 yards and 180 yards respectively, the whole cavalry force would be up with them at charging pace in 12 seconds—one-fifth of a minute, and the infantry would reach them at the double in 75 seconds; but this is upon the supposition that the attack takes place at the moment of first coming into action, subsequently every second brings the cavalry or infantry line closer and closer to the position of the artillery. A very small amount of circumspection on the part of the commandant of the attacking force, would preclude the possibility of anything like an attack in force upon the artillery in the advanced position. The pace required from the artillery is not excessive—about 16 miles an hour from the horse artillery, and about 12 miles an hour from the field batteries. Any improvement in the gun carriages (mounting the men of the field batteries or otherwise) which would enable the artillery to move at greater velocities for short distances, would enable us to reduce the distance of the artillery positions from the advancing line; upon approaching to close quarters with the enemy, while comparatively at a distance, long intervals between the positions of the artillery may in some respects be preferable; the limbering up and coming into action is not so frequent, and each battery remains longer in action. But if any improvements in the mechanism or arrangements of the artillery should be introduced, by means of

which the time occupied in limbering up and coming into action should be abridged, the distances between the successive positions of the artillery and the advancing line might be sensibly reduced. We have increased the rapidity of fire of our small arms until it has become a question with some whether we have not exceeded the mark as inducing hurry and want of steadiness in action as well as involving an excessive expenditure of ammunition.* However, recent experience seems to have proved beyond doubt the deadly effect of the rapidity of rifle-firing and the great power obtained in consequence; whatever doubts may exist in the minds of some as to whether the advantages gained by the long range of our small arms have fulfilled the expectations which were raised by the results obtained on the practice ground. We have expended much time, money, and energy upon increasing the range and exactness of our artillery practice, but some attention bestowed upon increasing the velocity of movement without risk and upon rapidity of fire, might be found advantageous also.

It may be said that the movements proposed require comparatively open and unobstructed ground to perform them on, but I have seen them worked on ground by no means unobstructed, but, on the contrary, intersected by small ravines, water-courses, rocks, and brushwood; a little management on the part of the artillery, and a column formation here and there on the part of the other troops, would get over the difficulty. But, granting that the movements do require comparatively open ground, it is in order to solve the difficulty involved in passing over the open ground, within range and in front of an enemy in position, that they have been proposed. It may also be

* Appendix (Note 27).

said, that however applicable nice calculations may be as to time, velocity, and distance to the working of machinery, or other matters where complete exactness in all the corresponding movements may be confidently calculated upon, they are not applicable to such a practical matter as the working of troops in the field, taking into consideration the many casualties to which they may be subjected; but, on the contrary, I have always found calculated movements of the kind proposed, work with much greater precision and exactness than I expected. But any one who will take the trouble to examine the calculations and the details of the drill founded upon them, will find that more than a sufficient margin for casualties and error of execution is allowed. If we cannot command the exactness and precision of machinery, we possess a compensating power which does not exist in mechanical movement, namely, the intelligence and judgment of the individuals directing the moving forces. The commandant of one arm, knowing the general intention of the manœuvre being executed, can accommodate his movements to that of the others, and can thus obviate the derangement which might result from any casualty produced by obstacles of ground, accident, or otherwise. It will be evident that the artillery movements can be made equally applicable to a line of columns as to lines deployed. So far the fire of artillery, only combined with the advance or retreat, has been taken into consideration. As the cavalry or infantry, in order to employ the fire of their small arms in formed bodies must halt to do so, it will be evident that, during the continuous advances or retreat, the fire of skirmishers only can be brought into action; but the advance or retreat may be made by alternate bodies, each line remaining halted while the other line advances or retires some given distance. In this case it is possible for the bodies composing the halted

line to avail themselves of the action of their small arms in the advance, until the advancing line has come into alignment with them; and in the retreat from the time that the retiring line has passed them, until the time has arrived that they should go about and retire in turn. The fire of cavalry, mounted in formed bodies, seems to have been in abeyance since the time that Frederick the Great interdicted the use of the badly constructed and inefficient firearms of his day, and organised the splendid cavalry, which, using only the *arme blanche*, performed such prodigies under Seidlitz, Ziethen, and other cavalry commanders. Times are now changed, both the firearms of the cavalry as well as the artillery, and firearms of the infantry with which they have to contend, are better constructed and more efficient than they were in those days; but as yet no experiences in modern warfare would seem to warrant us in adopting the system of cavalry-firing mounted in formed bodies. Therefore, as far as the cavalry are concerned, we may conclude that during the advance or retreat we can only avail ourselves of skirmishing fire; considering, therefore, only the retreat of the cavalry by alternate bodies, when protected by the fire of the artillery, and taking the pace of the cavalry at the walk, and the pace of the artillery at the trot, the distance between the consecutive positions of the artillery, and also of the alternate lines of the cavalry, would be 120 yards, allowing of the artillery remaining in action 120 seconds in each position.* Taking the pace of the cavalry at the trot, and the pace of the artillery at 16 miles an hour, the distance between the consecutive positions of the artillery and also of the alternate lines of the cavalry would be 240 yards, allowing of the artillery remaining in action in each position 60 seconds. With regard to the infantry, the opportunity afforded by the temporary halt of each alternate advancing

* Appendix (Notes 2 and 7).

or retiring line, for using their firearms, should not be neglected; accordingly we find the movements, now treated of, laid down in our infantry regulations, but they are evidently calculated upon data collected at a time when loading occupied comparatively a long time; therefore, in constructing a movement like that now treated of, it was necessary to take the time occupied specially, into consideration, so as to avoid the casualty of both lines being unloaded at the same time. The object to be obtained was, that in the advance the advanced line should not fire till the rear line had loaded and had received the word "quick march"; and in retiring, that the front line should not fire until the rear line had halted and fronted, having loaded before going about. In the advance or retreat of the infantry by alternate bodies of skirmishers, supported by the fire of artillery as proposed, we find that when the pace of the infantry is the quick time, and the pace of the artillery the walk, the distance between the alternate lines of infantry should equal 180 yards (216 paces), allowing 240 seconds for the artillery to remain in action, and when the pace of the infantry is the quick time, and that of the artillery about 12 miles an hour, that the distance between the alternate lines of the infantry should be 60 yards (72 paces), allowing 80 seconds for the artillery to remain in action;* the time occupied by the advancing or retiring line in passing over the above distance at the quick time while in rear of the halted and fronted line is, as has been already stated, available to the latter, for the action of their rifles this time in the first instance would be 120 seconds, and in the last 40 seconds.

Captain Thompson, Aldershot, has kindly furnished me with the following information:—

"We have never had an opportunity of trying how quickly the Martin-Henry can be fired by men standing in

* Appendix (Note 3).

the ranks. Of course, the rapidity would in great measure depend on the pouch used. Firing single and from the shoulder, but with cartridges placed on a table, Mackinnon fired 20 rounds in 48 seconds, and Sergeant Bott, R.M., fired with about the same rapidity. At a six-foot square target, at 500 yards, with a two-foot square bull's-eye, Mackinnon fired 26 shots in two minutes, making 4 bull's-eyes 15 centres and 7 outers."

Taking the rate of rifle fire at 12 shots in the minute, that is a shot every 5 seconds, we should have in the first case about 24 shots from each line, and in the last 8. But, in advancing and retiring by alternate lines, each line in turn passes twice over the distance between the consecutive positions of the artillery.* This is evidently equivalent to passing once over the same distance with half the velocity at which the lines are marching. Therefore, in order to avail ourselves of the rifle fire during the advance or retreat, we must reduce the actual rate of progression by one half what it would be if the advance or retreat were made continuously in one line, as already described. This in the retreat may not be considered of importance; on the contrary, the time gained in each position for the action of artillery and the rifle fire may be thought more desirable than a quicker retrograde movement. But in the advance to the attack over open ground, exposed to the action of the artillery and small arms of the enemy, it may be desirable that the forward movement should be as rapid as possible. We might avail ourselves of the support of the artillery and skirmishing rifle fire during the advance as described, without diminishing the general rate of progression of the advancing force, if we could move our men at the rate of about six miles an hour instead of three; also substituting the rate of 12 miles an hour for the artillery instead of the walk, while the distance

* Appendix (Note 2).

between the positions of the artillery and the alternate lines of the infantry remain at 180 yards, allowing 120 seconds for the artillery to remain in action.* But this would involve a run for our men of 360 yards, at the rate of 6 miles an hour, to be immediately succeeded by firing. As this might not be considered desirable, even in skirmishing, we might take a middle course, which, without sensibly diminishing the progressive movement of the attacking force, would allow us to avail ourselves of the action of the rifles and artillery. Taking the pace of the artillery at 12 miles an hour, the distance between the positions of the artillery and alternate lines of infantry at 90 yards (108 paces), if the advancing skirmishing line of the infantry passes over the 90 yards in rear of the alignment of the halted line at the quick time, and, subsequently, the 90 yards in advance of such alignment at the rate of 6 miles an hour, the men would only have a run forward of 90 yards, succeeded by a halt of a minute and a half.† This movement would allow one minute for the action of the rifle fire in each position, about 12 shots per rifle from each line, and the general advance of the attacking force would also be supported by the continuous fire of the artillery, the movement allowing of the artillery remaining in each position 90 seconds in action. The velocity of the progressive movement in the advance would be one-third less than if the advance was effected by the whole force at the quick time; but we gain the great advantage of the support of the artillery and rifle fire in advancing to the assault; and, although the general rate of movement is slightly diminished, the continuous velocity of the advancing force is sufficient to render it difficult to obtain the exact range, which might be obtained if the whole line halted to fire. This movement might be applied to the retreat as well as to the advance, the first 90 yards being

* Appendix (Note 3). † Appendix (Note 3).

made at the run, so as to clear the front for the fire, and the last 90 yards at the quick time.

It is generally considered that the line fire of infantry is not effectively available at a longer range than 500 yards, and that, taking into consideration the increased effect of rifle fire in the present day, it is not safe to bring our artillery batteries within that range; consequently, except in very extreme cases, the artillery fire must cease before the line fire has commenced; therefore, up to 500 yards, all that has been stated must be considered as applicable to alternate lines of skirmishers, firing at long range, supported by the advancing line.

Upon arriving within 500 yards of the enemy, the artillery can retire under the protection of their escort to the second line or otherwise as may be ordered, and the line fire (alternate bodies of skirmishers in the intervals) taken up.

The distances being definitely laid down, there should be no difficulty in attaining a practical approximation, even when the distances are no longer given by the artillery markers.

The line formation would be effected under the cover of the artillery and skirmishing fire, so as to commence line firing by alternate bodies when arrived within 500 yards.

I shall conclude this part of the subject by a quotation from Colonel Hamley's work, "The Operations of War":—"Jomini, who had not only thought and written much upon war, but had been present in a great number of battles, considered that the best formation for attack he had ever seen (and which seems to have been executed at a review, not in actual conflict) is that of two lines of battalions formed in double column of companies on the centre, advancing thus—The first line, on approaching sufficiently near for effective fire, deploys, each of its battalions throwing out the two flank companies as skirmishers. This

leaves opposite the columns of the second line intervals equal to their fronts, through which, as soon as the fire of the first line shall have produced sufficient effect, they advance to the charge. Jomini considers that no troops could resist this combination of fire and of shock."

We cannot have better authority for the best mode of formation in the attack of infantry. I should only modify it so far as to make the deployment of the first line on the move continue the advance, supported by artillery and skirmishing fire, in successive positions, till arrived within rifle range of the line, and then, instead of halting to fire, bring the rifles into action on the move, according to the principle indicated in the Appendix,* the details of the execution of which will be found described in the drill. After the line formation, the skirmishers might occupy the intervals in each advancing line till the time for the advance of the assaulting columns of the second line should arrive, when, if the assault prove successful and the enemy's line was broken, a portion of the force could change front, according to the principles laid down in the Appendix,† while the remainder held the enemy's second line in check. The details of this movement would be as follows:—The first line, of six battalions, formed in quarter-distance columns on the centre companies of battalions at deploying distance. The line would pass from a quarter-distance column formation to a formation in direct echellon of companies, at 23 yards' distance on the move, the base companies advancing at the quick time, while the remainder take up the double in 32 seconds, while the leading companies, or bases of formation, pass over about 48 yards. This would give the men of the flank companies a run of about 80 yards.‡ The line would then be formed in 69 seconds at the double, while the leading companies, or bases, passed over a distance of 103 yards at the quick

* Appendix (Note 3). † Appendix (Note 18). ‡ Appendix (Note 4).

time: this would give the men of the rear companies a run of 172 yards. Therefore, the line formation would be completed in 1 minute 41 seconds, while the leading companies, or bases, passed over a distance of 151 yards.* It will be evident that the movements recommended might be applied to many other cases, but I have selected the above as illustrating movements and combinations recommended by high authority.

Movements in Echellon.

All formations in which the units into which the line has been broken up are parallel to each other, may be called echellon formations, with the exception of the column formation, when either flank of the ranks of the formation covers the corresponding flank of the preceding rank—that is to say, the right flank of one covers the right flank of the other, or *vice versâ.* When the right flanks of the ranks of the echellons cover upon or are clear by a certain interval of the left flanks of the preceding ranks, or *vice versâ,* it has been customary in our service to call the formation direct echellon; and when either flank of the ranks of the echellon covers upon any intermediate point between the flanks of the rank in front, it has been customary when the distance between the corresponding flanks—that is from right flank to right flank, or left flank to left flank—is equal to or exceeds the extent of front of the ranks of the echellon, to call the formation oblique echellon.

Direct echellon without intervals can be formed from line without intervals, by the successive advance or retreat of the ranks of the echellon at any given distance. Direct echellon with intervals can be formed from line with intervals by the successive advance or retreat of the ranks

* Appendix (Note 10)

of the echellon at any given distance. Direct echellon with diminished intervals can be formed from line with intervals by the wheel forward or back of the ranks of the echellon.* The interval constantly diminishes as the angle wheeled increases, till, at a certain angle, the formation becomes a direct echellon without intervals.* The laws of this movement will be found in the Appendix; but, as an example, if squadrons in line, at intervals of one-fourth of the extent of front of the squadron, wheel forward into direct echellon till the inner flanks of the ranks of the echellon cover the outer flanks of the preceding ranks, the echellon distance will be equal to the extent of front of the squadron. If the squadrons should wheel up to half distance, the intervals would be reduced to about one-sixth, instead of one-fourth, of the extent of front. It is possible to wheel into oblique echellon from a line without intervals at any angle less than 90 degrees. At 90 degrees, the formation becomes a column formation. The laws of this movement will be found in the Appendix;† but, as an example, taking companies of infantry at 40 files, if the companies should wheel forward from line into oblique echellon at an angle of 45 degrees, the point of covering would be the 12th file from the outer flanks of the ranks of the echellon, and the distance from the inner flanks to such point, as well as the distance of the echellon, would be about 19 yards (23 paces); but, as these distances vary with the extent of front, no useful rules can be established in the matter.

If squadrons formed in direct echellon at full distance (squadron front and interval) should wheel into line, the angle wheeled up would be half right or left (45 degrees), and the squadron intervals would be trebled.‡ This would be too extended a formation, placing the squadrons too far apart from each other, consequently this has not been considered an eligible mode of formation. But if the squadrons,

* Appendix (Note 12). † Appendix (Note 13). ‡ Appendix (Note 14).

formed in direct echellon at half distance (extent of front of the troop in line), should wheel into line, the angle wheeled up would be quarter right or left (22 degrees 30 minutes), and the interval in line thus formed would only exceed the correct interval by four-tenths; that is, taking the squadrons at 48 files, and consequently the intervals at 12 yards, the intervals after the wheel into line from direct echellon, would only equal about 16 yards. It is unnecessary to enter here into a discussion as to the expediency of adopting the line formation with intervals between squadrons. It seems now to be generally admitted that for several reasons which must be familiar to every one who has taken the subject into consideration, this is the best formation for cavalry. We have adopted an interval of one-fourth of the squadron as being convenient and sufficient for the advance or retreat in squadron columns of divisions; but there is no magical influence in this particular proportion that we should adhere to it so rigidly, and sacrifice the employment of what might be a useful formation on an emergency to a close observance of conventional rules.

By a simple wheel forward from line, any number of squadrons with intervals (taking the squadrons at 48 files) may be placed in direct echellons at an angle quarter right or left with the former front in ten seconds, if the movement is made at the walk, and in five seconds if made at the trot, with all the advantages of attack and formation belonging to the formation in direct echellon, and with only very slightly diminished intervals. The advantages of the direct echellon formation have been fully recognized by the Comte de Bismarck and other writers on cavalry matters. Whether it is of vital importance to adhere literally to the conventional rule as to the extent of interval, and avoid all movements which might involve even a slight alteration, may be fairly decided by any one who will take the trouble to place themselves in front or rear of any considerable line of cavalry advancing at the trot or gallop.

The line formation with extended intervals indicated in the first movement mentioned, would not as matters stand at present be tolerated in our service; but that such a movement has been contemplated in other services will be apparent from the following quotation from the works of a high authority in cavalry matters in the Prussian service:—"In this order, the units of which the line is composed are side by side, but separated by intervals sometimes equal to the extent of front. The French apply to this order the term 'Tant plein que vide.' This formation may, under some circumstances, prove very advantageous. The movements can be effected with greater rapidity and ease; there is less pressure, and any temporary disorder in the ranks of any one squadron does not affect the order of the general line. A more extensive space can be occupied, and it will be easier to outflank the enemy; there will be less danger of being outflanked by him, and in case of any disorder it will be less likely to spread rapidly than would be the case in closer order. But the general leading and connection of the parts of the line, the solidity, the resemblance to a wall (which has led to this formation, being termed *en muraille*) are lost. Great results are not likely to be obtained in this formation, and for this reason it is avoided by the heavy cavalry, whereas light cavalry may frequently adopt it with advantage."

In the first movement mentioned, the squadrons wheel up from direct echellons half right or left (45 degrees) into line. The squadrons are by this means formed with intervals equal to three-fourths of the extent of front of the squadrons. Therefore, if we suppose the rear rank or support to make a corresponding movement (according to principles which will be mentioned hereafter) if one of the flank divisions of each squadron of the support should be thrown out as skirmishers, each interval of the first line would have three divisions of the squadrons of the second

line in rear of it. But if the squadrons in each line are of equal strength or nearly so, the intervals in the first line will be equal to the space occupied by the three divisions in the second line. The distance between lines or ranks may of course be modified according to circumstances. By this movement we should not only place the line at an angle of 45 degrees with the former front, but also extend the line by the same movement, one half with skirmishers out, and each interval covered by a corresponding body, which might be brought into first line if necessary. If then the second line of cavalry were brought up within short supporting distance, it will be evident that the force would be in an advantageous position to make a flank attack; for, upon the supposition that in the first instance the opposing lines occupied an equal extent of ground, we should not only place our force at an angle with the line of the enemy, but also outflank by the sudden extension of our line. A brigade of cavalry of two regiments of four squadrons, each of 48 files, could be placed in this position according to calculation, if the advance from line to direct echellon were made at the gallop out, in one minute and five seconds, and if at the trot, in double that time. Of course, for casualties in the execution of the movement more time should be allowed; but even making every allowance, no opportunity would be allowed the enemy of a counter-movement, for there would be no indication of the actual intention of the movement during the execution until the last moment preceding the completion.

Oblique echellon, which has been formed by the wheel forward or back from line or open column, can be formed correctly in line by a corresponding wheel of the ranks of the echellon, upon the supposition that the covering and distance have been correctly preserved. The line thus formed will be parallel to the original line, or else to the line of covering of the column from which the oblique echellon was formed. Oblique echellon, in general, can

wheel into line, with or without intervals, according to the extent of the echellon distance.*

Taking a regiment (strength as before), the regimental line would be formed from direct echellon of squadrons at half distance on a halted base in 9 seconds if the movement should be made at the gallop out, and in 18 seconds if at the trot, and a brigade of two regiments would be formed at the gallop out in 21 seconds, and at the trot in 42. A battalion of infantry, strength as before, formed in direct echellon of companies on the centre, at quarter distance, two companies detached as skirmishers, would be formed in line in about 8 seconds if the movement was made at the double, and in about double that time if the movement was made at the quick time. The distance to be passed at the double would be about 20 yards. If the line formation should be made on a moving base, a cavalry regiment would be formed from direct echellons at half distance in 12 seconds, while the leading squadron passed over 24 yards, if the formation should be effected at the walk and the gallop out; and in 36 seconds, while the leading squadron passes over 72 yards, if the formation should be made at the walk and trot.† For a brigade of two regiments it will be sufficiently near if we double the times and distances.

Taking the infantry as before, in quarter distance echellon on the centre companies of battalions, the line formation will be effected in about 20 seconds; while the leading companies pass over about 13 yards, the movement being made at the quick time and the double. The rear companies would have to pass over a little more than 50 yards at the double.

An echellon is said to be reversed when it is changed from a formation right in front to a formation left in front,

* Appendix (Note 13). † Appendix (Note 10).

or *vice versâ.* This movement may be effected in two different ways; first, by the wheel of all the ranks of the echellon, and, secondly, by the movements of the ranks of the echellon on direct lines perpendicular to the frontage. If the ranks of a direct echellon, formed at any given distance and interval, should wheel into line and subsequently forward again into direct echellon, an angle equal to the angle wheeled into line, the echellon will be thus formed with correct distance and interval, but in an inverted order;* that is, if the right flank was the leading flank in the original formation, the left flank will be the leading flank in the new formation. The tangent of the angle wheeled by the ranks of a cavalry formation in direct echellons into line, is equal to the echellon distance in terms of the squadron front and interval. It so happens that the tangent of 22 degrees, 30 minutes (quarter right or left), is equal to two-fifths of the radius, that is, to twice the division distance, or the extent of front of a troop. Therefore, if any number of squadrons in direct echellon, at half distance right in front, should wheel into line, and again forward an equal angle into direct echellons, the echellon will be reversed and placed fronting in a direction at an angle of 45 (half left) with the original front: Taking the strength of the squadrons as before, this movement would be effected at the trot in less than 10 seconds, whatever might be the number of squadrons in echellon; therefore, in less than 10 seconds a body of cavalry of any strength could be placed fronting in a direction, at an angle of 45 degrees, with the original front in direct echellons at half distance, ready to attack in that order if necessary, with correct intervals in the new direction. Therefore, the transition or actually helpless state of the cavalry during the change would only last for 10 seconds, whatever might be the strength of the force. The change having been effected and the echellon reversed, the

* Appendix (Note 9).

regimental line could be formed, as has been already stated, in 9 seconds, and the brigade line in 21 seconds at the gallop out, and the regimental line in 18 seconds, and the brigade line in 42 seconds at the trot. At the latter pace the movement ought to be made with perfect steadiness, whatever might be the number of squadrons. An infantry echellon can, of course, be reversed on the same principle (*see* Infantry Regulations). This movement might be made specially applicable to the formation in quarter distance column on the centre companies of regiments (which seems to be the favourite formation of the day) at deploying distance, for in this case the half of the distance between columns (extent of front of four companies) is also two-fifths of the distance between the corresponding flanks of the ranks of the column, therefore in this case the same principle applies as in the case of inversion of squadrons of cavalry at half distance.*

By the direct movement a cavalry regiment halted in direct echellons at half distance can reverse at the gallop out in 18 seconds, and at the trot in 36 seconds; a brigade of two regiments in about double these times. A regiment on the move at the walk can reverse in 23 seconds at the gallop out, while the originally leading squadron passes over 46 yards, and at the trot in 92 seconds, while the same squadron passes over 72 yards.† For a brigade of two regiments it will be sufficiently near to double the above times and distances.

We now come to the passage from direct to oblique echellons, and *vice versâ*. The laws of this movement will be found in the Appendix, but as an illustration of its application, we will suppose a force of cavalry formed in direct echellon of squadrons at half distance right in front. If the squadrons wheel half right, the formation becomes a formation in oblique echellon of

* Appendix (Note 9). † Appendix (Note 11).

squadrons right in front at an angle of 45 degrees, with the former frontage echellon distance equal to the squadron front and internal, and the covering point for the right flank of each squadron, the centre point of the preceding squadron. This is a formation possessing the advantages of the oblique echellon formation with reference to gaining ground imperceptibly to a flank during the advance, and thus gaining a position favourable for a flank attack, and at the same time free from some of the disadvantages of the oblique formation; inasmuch, as the echellon distance is always known, and the covering point for the inner flanks of the ranks of the echellon is well marked (being the centre of the preceding squadron), and does not vary with the extent of front during the advance; in this formation, the squadron markers would mark the centre points of their squadrons, and might hold up their swords. While in this formation, the distance gained to a flank will be always equal to the distance gained in the direction of the original front.* From the oblique echellon formation described, the whole force of cavalry, consisting of any number of squadrons, may pass by a flank movement of squadrons by fours to the left to a formation in direct echellon at full distance, fronting the same way as the oblique echellon right in front, in 9 seconds, which, allowing for the wheeling of fours, &c., may be called 20 seconds, and by a flank movement of squadrons by fours to the right to a direct echellon left in front in 21 seconds, which, allowing for the wheel of fours, &c., we may call 30 seconds; the force would in either case be in a position affording all the advantages of the direct echellon formation for attack, change of front, &c., which have been already described. In the last case, according to the present system, the squadrons would be inverted.

Returning to the oblique echellon formation. From this formation the squadrons can wheel into line with

* Appendix (Notes 8 and 17).

slightly increased intervals; the intervals, when in line, amounting only to about 16 yards. A wheel forward from line quarter left would place the whole force in direct echellons left in front at half distance, fronting in a direction at right angles with the frontage of the force, when in oblique echellons.

A reverse of the echellon by the direct movement, and a second reverse by a wheel of the squadrons half left would place the whole force in direct echellons, fronting in a direction at right angles with the original frontage, when in the first formation, in direct echellons.

An examination of the movements just indicated will, I think, show that they might be turned to account in a flank attack. The advance is first made in direct echellon at short distance. A single wheel of the squadrons suddenly places the whole force in a position to gain ground rapidly to a flank, and at the same time to the front. When sufficient ground to a flank has been gained, a simple wheel of the squadrons places the whole force in direct echellons, fronting in a direction oblique to the enemy's line, upon the supposition that the two lines were originally parallel, or nearly so; and a third movement, which has been described, would place the attacking force on a line perpendicular to that of the enemy. There is nothing to prevent these movements being made at the trot, there is nothing more difficult to be executed than a wheel of squadrons and an advance in echellon.

Change of Front.

It appears to me that, by far the best mode of executing a change of front for a body of cavalry, when ground and space permits, is by means of the direct echellon of squadrons. While in a direct echellon formation of squadrons the cavalry may fairly be considered to be in fighting order, and from direct echellon a very few seconds places a force of cavalry in line at the faster paces,

it has been already shown that, from direct echellon, a front in fighting order can, on an emergency, be shown in any direction required; this in the change of front of large bodies would be important. The only time during the change that the cavalry is helpless for attack or defence is for less than 10 seconds, while the squadrons are wheeling, in order to place the front of the echellon in the new direction; and this is the case whatever may be the force of the cavalry, or the number of squadrons engaged in the manœuvre.

I conceive there are many objections to oblique echellon when applied, as at present, to cavalry movements and formations, and therefore should not recommend the employment of it in changes of front. One of the arguments generally brought forward in support of its employment is, that in formations to line from column, or in changes of front, it saves distance and time. As an illustration of this, it will be found that in the change of front, half right or left, by means of the direct echellon, the distance passed over by the reverse or wheeling flank during the change is in the case of a brigade of cavalry of twelve squadrons in first line (which would be about the largest force that might be supposed to change front from line) 592 yards, whereas the distance passed over by the reverse flank in the same change by means of the oblique echellon of troops would be 546 yards.* The difference in distance, therefore, is only about 46 yards, and if the movement was performed at the trot the difference in time would be only about 10 seconds; this would be a very small saving of distance and time to put against the advantages gained by employing the direct echellon formation in squadrons instead of the oblique echellon of troops; besides which, I think the saving would be found to be more nominal than real, for more time would be lost in rectifying

* Appendix (Note 18).

the unsteadiness produced in a large body of cavalry by the passage in oblique echellon of troops over a considerable space at a rapid pace. The change, amounting to the eighth of a circle, is effected by means of the direct echellon, by an advance in direct echellon from either flank to half distance, a wheel of the squadrons an angle of 45 degrees, and a subsequent formation to line.*

The change, amounting to the quarter circle, is effected by an advance in direct echellons at half distance, a wheel of the squadrons an angle of 45 degrees, a reverse of the echellon upon the direct lines, a second wheel of the squadrons, and a subsequent formation to line. With good training, and a little attention on the part of the squadron leaders and markers, these movements should be made with perfect steadiness at the trot or gallop, halting for a moment at the wheeling points previous to the wheel. The modes of changing front in large bodies are distinctly laid down in the infantry regulations, but it will be evident that a change of front might be executed as just described by employing a formation in direct echellon of grand divisions at half distance. In order to protect the change of front of comparatively large bodies by the action of artillery, we must consider the distance passed over, and the time occupied by the force of cavalry or infantry performing the movement, and arrange the velocity and movement of the artillery so as to fulfil the conditions stated in treating of the advance and retreat in line; and also so that the change may be commenced at any moment during the advance or retreat, supported by the action of artillery, without any previous preparation, and also so that at the completion of the change of front the artillery will be in position ready at once to continue the advance or retreat without any preparatory movements.

* Appendix (Note 9).

All "*Manœuvres Tournants*," as they are called, the design of which is to attack the enemy with superior forces on one flank, while we hold him in check with a comparatively small force upon the other, require, in order to their being effective, a change of front, in whole or part, of the attacking force. If we gain the flank of the enemy by any means, it requires a change of front to place the attacking force perpendicular to or at an angle with the line of the enemy's front. If we penetrate the enemy's line by an attack in column or otherwise, a change of front is required, in order to take advantage of the success by doubling up his lines, &c.

We cannot wheel large bodies right or left, as we can squadrons, companies, or grand divisions; but the more rapidly we can change the direction of movement without losing our formation in fighting order, or the steadiness of formation for attack, the more effective will all movements be depending upon a change of front. It seems to be thought that the time for the employment of "*Manœuvres Tournants*," except under some very favouring circumstances of ground, is passed; that they have been tried so often that the intention will be at once detected, and the attempt frustrated by the fire of the long-range artillery; or else the counter movement (now so well known) made so rapidly that the success of such a movement would be next to hopeless. But it seems to me that the success of these movements, so often tried with the best results, did not so much depend upon their being unforseen, or the intention unperceived, as upon the fact of the perception coming too late to parry them. If we can make our turning movements so rapidly that the enemy will not have time to complete his counter movements, and, that we take him in the act of formation, our success is next to certain.

On the other hand, if we can make our counter movement with rapidity sufficient to anticipate the enemy in his turning movement, it will most likely not only fail, but may be turned to our ultimate advantage. The rapid changes of front of a single brigade may turn the scale in these critical cases, and if supported by the prompt action of cavalry, may form a screen behind which larger bodies of troops may complete their movements, and if actually supported by the artillery in action during the change and subsequent advance as proposed, the artillery will be in a position to take the enemy's line, which has been turned in enfilade, and even one or two batteries may produce most important results when so placed. The movements of the artillery, in concert with the other troops during the change of front, have been calculated upon the supposition that the change is effected by means of the direct echellon movement, in which case the path of the body forming the reverse flank of the division or brigade is along the line of tangents of arcs of a circle, each equal to 22 degrees, 30 minutes, of which the extent of front of the force performing the change is the radius. But on the field of battle there may be many impediments to the change being performed in this way, even by brigades, and in consequence we may be obliged to have recourse to open quarter distance or close columns. But the distance passed over, and consequently the time occupied, is not materially altered by effecting the change by these means, instead of the direct echellon; and, with the exception of the oblique echellon, movement by troops or companies, the distance passed over and the time occupied will be found to be in excess; and, therefore, if the artillery move with the velocity and in the manner calculated with reference to the movement in direct echellons, if the change is effected by the column movement or otherwise, the only difference will be that the

artillery will remain a short time longer in action in each position.

The movements to be employed in the change of front or position for divisions or brigades are to be found in detail in our Infantry Regulations, and for the cavalry in the French "Ordonnance sur l'Exercise et les Evolutions de la Cavalerie. 1860. III. Partie." The principal modes of changing front in large bodies which may be employed are the following:—

1. By direct echellon of parts into which the division or brigade may be broken up.
2. By the oblique echellon of the same.
3. By an open column movement from a flank of the parts composing the division or brigade, which move on parallel lines, and enter the new line of direction at given points, then move along the line to their points of formation, and wheel into line.
4. By an open column movement from a flank of the parts composing the division or brigade, which move on parallel lines to their points of formation on the new line, and then form by oblique echellon to the front.
5. By a quarter distance column movement of the parts into which the division or brigade may be broken up, which form column, move to points of formation on the new line, and then deploy.*

As an illustration of what I have stated with reference to these movements, I shall give the distances passed over, according to calculation, by the reverse flank of the force performing the change of front, in the different cases just enumerated. Taking the line of cavalry at 12 squadrons of 48 files each, and the infantry at six battalions of 10 companies each of 40 files:—

* Appendix (Note 18).

Cavalry.

		Yards.
Case 1.—Half right	. . . .	593
Right	. . . .	1,186
Case 2.—Half right	. . . .	547
Right	. . . .	1,039
Case 3.—Half right	. . . .	878
Right	. . . .	1,319
Case 4.—Half right	. . . .	1,020
Right	. . . .	1,375
Case 5.—Half right	. . . .	1,106
Right	. . . .	1,557

Infantry.

Case 1.—Half Right	. . . .	1,382
Right	. . . .	2,764
Case 2.—Half right	. . . .	1,260
Right	. . . .	2,311
Case 3.—Half right	. . . .	1,625
Right	. . . .	2,587
Case 4.—Half right	. . . .	1,627
Right	. . . .	2,001
Case 5.—Half right	. . . .	1,662
Right	. . . .	2,561

The movements of the artillery have been calculated upon the supposition that the change of front is made by the means indicated in Case 1, that is by the direct echellon formation. When the distance passed over by the reverse flank of the body making the change of front is in excess of that indicated in Case 1, the result will be, if the calculated velocities are adhered to, that the artillery will arrive in the advanced position before the fire of the artillery in the rear position has been masked and silenced by the advancing troops; the consequence of this would only be that,

as already stated, each battery would be longer in position, and that two batteries might be in action for a few seconds together. Therefore the velocities calculated for Case 1 will answer for all the other cases, only leaving a wider margin for casualties. But the fact of its being necessary to have recourse to the column movements in the change of front implies the existence of some difficulties of ground, which will most likely also tend to impede or retard the movements of the artillery. Therefore in these cases the wider margin allowed will be advantageous. I have, therefore, calculated the velocity and movements of the artillery to correspond with the distance passed over and the time occupied in the change of front indicated in Case 1 by the other troops of the brigade.* A reference to the calculations will show that in certain cases a sufficient allowance has been made for the delays and additional time required, particularly with regard to the infantry when the change of front is made by means of the column movements. In considering the change of front of large bodies of cavalry or infantry, supported by artillery, we must take into consideration the following:—The changes corresponding to the different angles forward and back on the flanks and on the centre; when the artillery are on both flanks, on the reverse flank, or on the pivot flank; and when on both flanks, the case in which the advanced battery is on the pivot flank, and also the case in which the advanced battery is on the reverse flank; in order to enable us to commence the change of front at once during the advance or retreat of the division or brigade, supported by artillery, without being delayed by any preparatory movements; also the case in which it may be necessary to commence the change of front at an intermediate point between the positions taken

* Appendix (Note 18).

up by the artillery during the advance or retreat of the line. In order to this I have been obliged to go into each of these cases separately in turn and in detail.* If I had arrived at a different result in each case the labour bestowed would be of little use, inasmuch as it would be impossible to reduce the matter to any general rules of practical utility. But it will be seen that in all the changes when the artillery is either on both flanks or on the reverse flank, the rules with respect to the volocities and the details of the movements of the artillery and other troops engaged in making the change of front are the same, also that they are simple and easy to be remembered. When the whole of the artillery is on the pivot flank the change can be made with greater rapidity than in the other cases, with an equal extent of front, and with about an equal rapidity when the extent of front is reduced. In this case also the rules are simple and practical.

Decker and others who have treated this subject of the change of front of large bodies supported during the change by the fire of artillery, have generally retained the whole of the artillery on the pivot flank. But in the first place, in lines of considerable front, the artillery, if posted only on one flank, might not command the whole extent of front; and we cannot have the cross fire, which is so efficacious, without posting the artillery on both flanks; besides, what I should propose is, a rapid change of front made at any moment during the advance or retreat of the line; artillery in action; and under any circumstances, with reference to the posting of the artillery or otherwise; and not only this, but that also at the completion of the change the division or brigade should be able to continue the advance or retreat under the support of the artillery, and thus take advantage of the favourable position they

* Appendix (Notes 19 and 23).

may have gained by the change without losing those moments in preliminary movements which are so precious and irredeemable in such critical cases. And in order to all this, I have been obliged to provide for all the different cases with reference to the different modes in which the artillery may be formed when the change may be suddenly required.

It will be found that the velocity of the artillery varies inversely with the extent of front of the body making the change of front, and that the velocity of the other troops varies directly with the same.

It is desirable that the changes of front should be made as rapidly as they can be made with steadiness. I have therefore taken the velocity of the horse artillery at 16 miles an hour, and the velocity of the field batteries, when necessary, at 12 miles an hour. Also taking the cavalry front at 12 squadrons, and the infantry front at 6 battalions, as already stated, the results are as follows*:—

Artillery working on both Flanks or on the Reverse Flank.

We find that the pace of the cavalry under the circumstances just stated,—namely, velocity of the artillery 8 yards in a second, or about 16 miles an hour; extent of front, 12 squadrons of 48 files, about 700 yards—would be 2·9 yards in a second. We have no such pace in the cavalry, the walk being 2 yards in a second, the trot 4, and we have no intermediate rate; but by doing one part of the distance at one rate, and the remainder at another, the result is equivalent to doing the whole at a uniform velocity equal to 2·9 yards in a second.†

It will be found by referring to Tables in the Appendix,‡ that if one half the distance is performed by the cavalry at

* Appendix (Note 19). † Appendix (Note 5). ‡ Appendix (Note 20).

the trot, and the other half at the walk, or upon an emergency, one half at the walk and the remainder at the gallop, the result will be sufficiently exact for practical purposes. In the change of front half right the movement would therefore be as follows:—The artillery move from position to position at the gallop out. The cavalry move up in echellon to the first wheeling point for the squadrons at the walk, wheel at the walk or not, as ordered, and then trot up into line with leading echellon, or this may be reversed. The first portion may be done at the trot, and the last at the walk; and in the change to the right the cavalry move up to the first wheeling point at the walk, the echellon will be reversed at the trot, and the line formed at the walk. The artillery moving from position to position at the gallop out. We find that in the case of the infantry, taking the front as stated, and the velocity of the artillery at 12 miles an hour, the velocity of the infantry would be at a far higher rate than we could command; therefore, taking the velocity of the artillery at the trot (4 yards in a second) we find the velocity of the infantry to be 2·9.

Referring to the Tables in the Appendix, we find the uniform velocity at this rate correspond to $\frac{1}{8}$th of the distance at the quick time and $\frac{3}{8}$ths at the double; this would amount to performing the whole of the change of front at the double, with the exception of the last few seconds, before coming into line, when the troops would drop into the quick time; but this would involve a run for the men of between four and five hundred yards, and this might be considered too severe; but taking the velocity of the artillery at the walk, the corresponding pace of the infantry would be found to be about 1·7, this we find corresponds to $\frac{3}{4}$ths at the quick time and $\frac{1}{4}$th at the double; therefore, in the case of the artillery working at

the walk in the change half right, the movement would be performed by the infantry at the quick time, with the exception of the formation to line, after passing the wheeling point, half of which might be done at the double.

In the change to the right, the distance from the last wheeling point in forming line might be done at the double, the rest at the quick time. This might evidently be applied to the change of front of battalions in quarter distance columns formed upon the centre of battalions at deploying distance, as described in the echellon movements. So far we have considered the artillery as working on both flanks, or on the reverse flank; we shall now take into consideration the artillery working on the pivot flank.

We find that in this case, taking it in comparison with the others, we can either reduce the velocity of the artillery, increase the velocity of the cavalry or infantry, or else reduce the extent of front of the body effecting the change of front. This position of the artillery therefore is particularly applicable when the extent of front is small, and also when it is desirable to perform the change at a more rapid pace than usual. Therefore, if the artillery should have been working by batteries on both flanks, and it became desirable to effect the change of front at a more rapid pace than usual, it would be best to work the battery on the pivot flank by half batteries during the change, the battery on the reverse flank, merely moving to the point to be occupied when the change was completed.* Taking the strength as before, for both cavalry and infantry, artillery working on the pivot flank, and taking the artillery rate at 8 yards in a second, we find the velocity for the cavalry to equal 4·5; therefore, the whole movement might be performed at the trot. Taking the strength of the cavalry

* Appendix (Note 19).

at a brigade of two regiments of 4 squadrons of 48 files each, we find that when the velocity of the artillery equals 8 yards in a second, the velocity of the cavalry equals 3·8, which may be taken practically at the trot; whereas, if the artillery was working on both flanks, the cavalry could not exceed a walk, the velocity would be found to be 2·2.

Six battalions of infantry in contiguous quarter distance columns on the centre companies of battalions, with intervals of 6 paces, would occupy 345 yards.

Taking the velocity of the artillery at 6 yards in the second (about 12 miles an hour), we find the velocity of the infantry should equal 2·4. We find by the Tables that this is equivalent to $\frac{1}{4}$th at the quick time and $\frac{3}{4}$ths at the double; therefore, the movement might be done at the double, with the exception of the last fourth of the distance, in forming line, which might be done at the quick time. This would give the men on the reverse flank a run of about 200 yards when the change was half right, and about double that distance when the change was to the right.

II.—Movements in a Column Formation.

The formation of the cavalry regimental column in single ranks, that is to say, the whole of the front rank, followed by the whole of the rear rank or support in ranks, according to the frontage of the column, would follow, as a matter of course, from the adoption of the rank entire system. The advantages of the single rank system, with reference to the column formations and movements, are as follows:—

The formation from column to a fighting order is made from column of fours and under in one-half the time which the same formation would take if the ranks were double,

and during the subsequent advance an efficient support is gradually formed in the rear rank, which may be brought up as close as may be required to the advancing line. In consequence of the additional distance from head to croup in column, the leaders may be introduced between the ranks of columns of a less frontage than if the ranks were double. In consequence of the absence of the uncertainty caused by the opening or closing of the ranks in movement the distances may be more correctly kept. A column with a frontage of four men abreast can be formed with all the advantages of an open column as to wheeling into line, &c., whereas, in a movement of the same kind made according to the present system, the rear rank must be disentangled before the wheel into line can be effected.

As to the column movements the most important point to be attended to is the change of direction or successive wheel of the ranks of the column, for if this movement is not performed well and steadily the column movements generally cannot be made smoothly and regularly.

The column formation in rank entire greatly facilitates the correct performance of this movement, as will appear by a reference to the Appendix. I consider that our present system of wheeling in column does not bear the test of analysis; the first principles are not sound, and no amount of training or perfection in execution can compensate for this.* The principal feature of the column system proposed, is, that the regulating point is in the centre of the ranks of the column. The details of all this matter, as well as all details with reference to the frontage of the column, will be found in the Appendix.†

In Section 28 of the Infantry Regulations, we find the following, under the head of changing directions

* Appendix (Note 21). † Appendix (Note 22).

on the moveable pivot:—"The men will wheel to the "right, the pivot man bringing his shoulders gradually "round with his squad, at the same time circling round the "wheeling point with very short paces." This perhaps is good when wheeling into echellon on the moveable pivot, but in the successive wheels of the ranks of an open column during a change of direction, I should suggest that the pivot man should circle round the wheeling point at a distance equal to about the depth of ranks (one pace of 30 inches), and that when the change is the quarter circle each column rank in turn should arrive opposite to the wheeling point, and receive the word to wheel when the preceding rank has completed about three-fourths of the wheel.* These may seem small matters, but I have seen a considerable loss of column distance in marching past, and at other times produced by the pivot man circling too close round the wheeling point, thus leaving no place for the next rank of the column till the word forward was given to the wheeling rank, and by the consequent delay in giving the word to wheel to the next succeeding rank.

III.—The Passage from one Order to the other.

Column is formed from line by the wheel of the ranks of the future column. There are movements adopted in most services, which, in the advance or retreat in column, obviate the necessity for the wheel of the column rank on the flank, from which the advance or retreat is made; but it has always seemed to me that these movements unnecessarily encumber the regulations. As to the cavalry, our squadron intervals give us a sufficient liberty of movement,

* Appendix Note 21).

and except in extreme cases, the simple wheel of the ranks of the column, with a subsequent change of direction, ought to be sufficient. For the extreme cases, some temporary expedient might be devised, *impromptu*, to suit the occasion. Even in infantry movements of this kind, although the intervals between battalions in line are small, it seems to me that the sort of complication and uncertainty involved in the following movement, might be dispensed with.

S. 29. *Advancing from a Flank by Companies.*

"The caution will specify from which flank the ad-
"vance is to be made, and on the word 'march' the named
"company will move to the point at a short pace, receiving
"the word forward from its captain, at such time during
"the second wheel of the next company as will prevent
"distance being lost between them, when the latter re-
"ceives that word."

If it should be necessary for a brigade, formed into line, to advance or retire from the flanks of battalions in column of sections, divisions or companies, upon the supposition that there is room for the wheel of the flank company of the brigade, the movement might be effected by the simple wheel of the ranks of the columns, followed by a change of direction of each battalion column; as, taking the six paces interval between battalions into consideration, the wheel up of the ranks of each battalion will leave room for the change of direction of the head of the succeeding column, all moving off together. The other movements, which come under the head of formations in column, are simply, first a formation in small columns by the wheel of the ranks of the column in cavalry, or a small column formation according to the mode laid down in the regulations in infantry, and a subsequent formation of a larger column by a column movement.

The passage from open column to line is generally effected, according to the present system in our service, both in cavalry and infantry, by means of the oblique echellon of troops or companies. The objections which I conceive exist to this movement in cavalry formations will be found in the Appendix,* and as the quarter distance column formation will most likely, to a certain extent, supersede the open column formation in infantry service, movements,† I shall confine myself at present to the consideration of what are generally called deployments, that is, a passage from column of considerable frontage to a direct echellon formation by means of columns of small frontage, and a subsequent formation from direct echellon to line by a movement on direct parallel lines. One of the best means of opposing the increased efficacy of artillery fire is to make our formations *en bataille* on the move. In the cavalry, the power we possess of sustaining an increased pace for a considerable time gives us a great facility in this matter. The details of the passage from column to direct echellons, and then to line, both for cavalry and infantry, while the base remains halted, will be found in the Appendix.‡ But I shall now, for the reasons just stated, only consider the formation on a moving base; and first, as to cavalry field columns.

I should propose that cavalry field columns (that is, columns of squadrons, troops or divisions) should, in the first place, form indifferently to either hand (right or left) according to the mode of formation employed in our present movement from column called inverted line to the front. This is, to a certain extent, a protected movement,

* Appendix (Note 24).

† *Note by Colonel Hamley.*—"I doubt if it can ever be advisable to form open column at all."—E. B. H.

‡ Appendix (Notes 4 and 10).

and ought to be performed with steadiness at the faster paces. If the formation is made from column of squadrons, each squadron when arrived in echellon is in a fighting order and may attack to the front. When this movement is made from close or quarter-distance column of squadrons by means of columns of fours, it becomes what is called a simple deployment. Now that we have admitted quarter-distance squadron columns amongst our cavalry formations, it will most likely be much used in our cavalry movements, particularly when working in brigade. It is free from many of the disadvantages of close column formation, inasmuch as there is more room for the passage of air and escape of dust in quick movements, and it possesses the following advantages:—When the passage from column to echellon has been effected, by means of the column movement by fours or divisions, the squadrons have, in order to arrive in line, to pass over only one-fourth of the distance which they would have had to pass over if the movement had been made from an open column formation. The rank entire system is peculiarly adapted to this mode of formation in quarter-distance column, for there is more air and opportunity for the escape of dust than if the ranks were double, and there is plenty of room for the movement of the leaders between ranks, even when the strength of the squadrons is reduced as low as 32 files.

In this formation we are, of course, precluded from the immediate passage to a line formation by the simple wheel of the component parts of the squadron. We must first form direct echellon by the small column movement, and then line by squadrons. A movement is mentioned, but not recommended, by Decker, in his work upon the "Three Arms," which he states to have been invented by the supporters and advocates of column formations for the cavalry, by means of which a quarter-distance column of

squadrons, facing in any given direction, passes to a similar formation facing in another, by a simple wheel of what we call divisions, as follows:—The divisions of all the squadrons simultaneously wheel the quarter circle to the right or left; this evidently places the force at once in quarter-distance column, facing at right angles with the former frontage. The squadrons composing it being formed respectively of the divisions of the same numbers in each squadron, and the officers are supposed to take command of the numbers corresponding to the numbers of their own squadrons in the original formation. This seems rather too complicated for practice, although I believe a similar formation has in former times been effected when small bodies of regular cavalry were opposed to numerous bodies of barbarian irregular troops; but although I think we adhere in many matters too rigidly to conventual rules, I should not advocate the intermixture of squadrons in the manner described. I think the squadron should be intact as the regimental unit fours (rank of four men); as the squadron unit, however, the relative positions interiorly may be changed.

The formation by a wheel into line previous to an attack by a force of any considerable strength, has the following disadvantage:—If it has to be made (as would be the case under present circumstances) exposed to the fire of the enemy's artillery, the force about to attack must pass in its whole length on a line parallel to the enemy's position, then there is a momentary check during the wheel into line, whereas during the deployment from quarter-distance columns on the move, there is a constant, though gradual advance of the whole force on a line perpendicular to the enemy's position, and this would tend to render the appreciation of distance more difficult and the enemy's fire less effective than would be the case if the movement was on a

parallel line, or if the formation was made on a halted base. As an example of the practical application of the cavalry formation in quarter-distance columns, we will suppose a brigade of cavalry of 12 squadrons (two regiments usual strength, squadrons 48 in each rank) formed in quarter-distance columns on the inner flank, in rear of the centre of the second line of a division of infantry, 12 battalions, first line deployed, second line in column; we will suppose two batteries of horse artillery in columns of half batteries or divisions, in rear of the front rank, or first line columns of the cavalry, followed by the rear rank or supporting columns. The three inner flank companies of No. 3 and 4 battalions 1st line will form quarter-distance column in rear of No. 4 and 7 at the double, which will leave a sufficient opening for the head of the column. This will be done in less than 30 seconds; there will be plenty of time for this movement, as the cavalry column will take about three minutes to arrive from the rear of the second line at the trot. The column will pass through the opening at the trot, till the rear of the front rank columns, the depth of which will be 60 yards, shall have cleared the line of infantry; this will occupy about 15 seconds. The column will then break into the walk, and the order or signal to form on the move will be given. The direct echellon of squadrons will be formed at the trot in 1 minute while the leading squadrons of the brigade, or base of formation, is passing over 120 yards at the walk,* and the line will be formed in 1 minute 30 seconds, while the leading squadrons are passing over a distance of 180 yards.† The batteries of artillery should move with the flank squadrons of regiments, form on the flanks, and advance with the line till ordered to the front for action.

* Appendix (Note 4). † Appendix (Note 10).

The line has thus been formed within three minutes, within a distance of 300 yards, with artillery on both flanks, ready to act when required, and the pace of formation has not exceeded the trot. The line can then advance, artillery in action, each battery taking up successive positions till within charging distance, when the cavalry will increase the pace, and finally deliver the assault, the artillery forming with the support or otherwise as may be ordered.

If the formation from direct echellons to line should be made at the gallop out, the passage from column to direct echellon being done at the trot, as before, the entire line formation will be effected in 1 minute 30 seconds, while the leading squadrons, or base, pass over a distance of only 180 yards.

If the whole movement should be performed at the gallop out, the formation should be completed in one minute, within a distance of 120 yards.

It will be evident that the movements indicated may be applied under various and different circumstances. I have only given the above as an illustration of one of the simplest.

The rear rank, or supporting column, having cleared, the infantry will form in direct echellons in the same way as the first line, but remaining in direct echellons instead of forming line, which will leave sufficient openings for the retirement of the first line, if necessary, after the passage of which the support can either attack in echellons or else gallop up into line. The leading squadrons of the support, while both lines remained at the walk, would be about 60 yards from the first, which distance could be increased or diminished as circumstances might require. The second line of cavalry flanking columns, reserve, &c., might of course be formed as usual in column or otherwise;

the only change in this particular that I should advocate would be placing the rear rank in a position to give real support to the front rank during the attack.* But the most important point relative to the subject we are now treating of, is the solution of the following problem:—

How are we to form the cavalry effectively in fighting order from small columns, or columns of route upon a moving base, exposing the force in process of formation as little as possible to the fire of the enemy's artillery? The long range of the artillery of the present day renders it necessary that we should keep our cavalry, which we intend for immediate action, under protection of accidents of the ground if possible. Accidented ground must be passed over in columns of route or small frontage, consequently the cavalry when required for action must issue from cover in such formation. They must not stop to form and become a standing mark for the enemy's artillery. Late wars have also shown how difficult it is to disentangle the cavalry from infantry, which has been engaged in close ground, and free them for the pursuit or other action. Increasing the front, as it is called, requires time, and if it is done on the move distance and in the mean time we are approaching to the enemy without being in a condition to meet him. The object to be attained is to get into fighting order as quickly as possible, with as large a force as possible, and at the same time to ensure the formation of an effective support in the rear, while the formed portion attacks to the front. Also to protect the unformed portion by the formed portion as much as possible from the view of the enemy. Also to place the movement completely under the control of the conductor, so that by a very simple means he can modify the execution of the move-

* Appendix (Note 26).

ment so as to complete his formation to fighting order rapidly, within a short distance or slowly, while passing over a considerable distance, as circumstances or the exigencies of the case may require. Any one who will take the trouble to read the portion of the Appendix relating to this subject will see that much trouble has been taken in working out the matter in all its details.* It struck me that it was one of those cases in which trouble bestowed upon the minute details would tell in the general result. I dare say many will think that the trouble expended has been profitless, and the labour bestowed in vain; a single word from some one whose opinion has weight, and perhaps that word spoken without much consideration, to the effect that that kind of thing won't do for cavalry movements, or that we managed to form very well according to the old system upon many critical occasions, will probably upset the whole matter. The details of this movement are so clearly laid down in the Appendix that any one wishing to do so can easily make himself master of them. They require to be a little studied, and therefore I cannot make them clearer by a mere description.

Pace.

Artillery and Cavalry.

When we speak of pace or velocity we must have some standard to measure it by. Our present standard is hours in time, miles in distance. I should propose for a standard seconds in time, yards in space or distance, and that the velocities or rates should be as follows:—

Walk . . .	2 yards in 1 second.
Trot . . .	4 „ „ 1 „

* Note 25.

Gallop . . .	6 yards	in 1	second
Gallop out . .	8 „	„ 1	„
Fast gallop . .	10 „	„ 1	„

The three first rates do not differ very materially from our present rates. The walk would be four miles an hour, as it is at present; the trot, about eight miles an hour; the gallop, about twelve. It will be seen that the standard of paces proposed consists of an arithmetical series of five numbers, of which the extremes are two and ten, and the common difference two. I think it will be apparent how valuable such an arrangement might be made in the combination of paces, and consequently in formations on the move.

Infantry.

The old rate of the infantry quick time in our service was 108 steps or paces of 30 inches (90 yards) in a minute; 1·5 yards in a second; 3 miles 120 yards in an hour. This rate has been slightly increased, and the present regulation is 110 steps or paces (91 yards 24 inches) in a minute; $1\frac{2}{3}$ yards in a second; 3 miles 220 yards in an hour. The old rate was $\frac{1}{6}$ of a yard less in a second, 1 yard less in a minute, and 100 yards less in the hour than the present rate.

It is certainly desirable that the ordinary regulated pace for performing the field movements should be as rapid as it can be made, without distressing the men; even a small acceleration of pace was of importance in the movements and formations of comparatively large bodies made according to the old system, which, as a rule, were generally effected upon a halted base. But now, when it is desirable that all formations should be made as much as possible on the move (that is, on a moving base) so as to avoid affording a standing mark to the enemy's artillery and small arms during the formation, it is necessary to take another

important matter into consideration, and that is, the combination of paces. The only two paces available to us are the quick time and the double, and the latter only for short distances. (*See* Infantry Regulations, page 205.)

We must, therefore, for these reasons, keep our slower pace at a moderate rate, as otherwise we could not make our formations on the move in sufficient time, without increasing our faster pace to a rate which, with reference to the capabilities of the men, might be considered excessive. I should, therefore, propose a return to our old rate of 1·5 yards in a second. The difference from the present rate is very small, and even if the present rate was retained for all parade movements, &c., it would be well to leave a small margin for the retarding effects of rough ground, exhausted energies, and other casualties in calculating the formations as performed on actual service. The present rate of the double is 150 steps or paces of 36 inches (150 yards) in a minute; 2·5 yards in a second; 5 miles 200 yards in an hour. If a sustained effort for a considerable time over a considerable distance for men under arms and in formed bodies should be contemplated, it would be well to adopt a slow rate for the double time. But in order to expedite formations in the field or to effect formations on a moving base by a combination of paces, in which cases an acceleration of pace for only short distances are required, it appears to me that a quicker rate would be more advantageous.

I should, therefore, propose that taking the quick time at 1·5 yards in a second, the pace to be adopted on these special cases, when rapidity of formation is particularly desirable, should be a *bonâ fide* double, 3 yards in a second, 180 yards in a minute, 6 miles 240 yards in the hour. This rate should only be required in the formations for a hundred yards, or so, at a time.

If any one will take the trouble to measure off 90 yards upon any level piece of ground, I think they will find they can walk it without distressing themselves in the least in 30 seconds; more than this rate has been done, fair heel and toe walking, sustained for an hour; and, therefore, I think we may require a short run from our men during the formations at this rate.

This I conceive should be a practised pace in formations on the move, when the distances are short. In the Infantry Regulations, page 356, we find the following:—

Although 150 steps are taken in a minute in the ordinary double time in light infantry movements, the speed may be increased when necessary, as will be the case when skirmishers close on files that are moving at the double.

It may be well to put our men in wind and condition for more sustained efforts in skirmishing and other movements by practising the running drill, or otherwise; but the rate in such cases will most likely actually depend upon the physical capabilities of the men individually as to the rate of double during the wheel of columns, &c., that must, of course, be modified according to circumstances, and must sometimes be momentarily reduced to an actual mark time, or nearly so.

In the Prussian service the ordinary rate of movement is 112 paces of 2 feet 4 inches (28 inches) in a minute, 1·45 yards in a second; the double, 120 paces in a minute, 1·9 yards in a second.

In the French service the pas accéléré is 110 paces of 65 centimètres in a minute, 1·3 yards in a second; the pas gymnastique 165 paces of 83 centimètres in a minute, 2·8 yards in a second.

Markers.

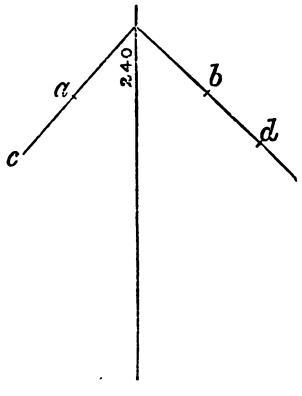
There should be a marker told off to each battery to give points for the successive positions of the artillery when working with the other arms, and also a few additional men trained in case of casualties. In order to train the men and horses to this work the following distances should be measured off upon any level piece of ground:—180 yards, 240 yards, 360 yards, 480 yards.

The men should be trained to pass over these distances as follows:—

Yards.	Seconds.	Paces.
180	22·5	45
240	30	60
360	45	90
480	60	120

At the velocity above indicated (the gallop out about 16 miles an hour, 8 yards in a second) the pace or stride of most horses will be found to equal four yards, which gives the number of paces set down in the table, or so nearly as to be sufficient for practical purposes. In exceptional cases, when on account of the formation of the horse, or from other causes, the number of paces at the velocity stated is less than that indicated in the table, the volocity should be reduced, or if the number of paces is greater, the velocity should be increased till the correct number of strides in each given distance is arrived at, or at least a sufficiently close approximation to it; but in these exceptional cases it might be better to change the horse for another better fitted for the work. All that is aimed at in this instruction is that the men who are to act as markers should get so far accustomed to the stride of their horses

when moving at a certain rate, as to be able to measure distances approximatively by counting their paces; but I have always found that the exactness of these measurements made at the gallop wonderfully exact, and that one-fourth of the distance in yards taken in strides of the horse at the gallop out will give distances with quite sufficient accuracy. A certain number of men also should be told off from the cavalry to act as brigade-markers. They should be subjected to the training already described, and also to the following:—Take upon the chain or measuring tape the distances in feet or yards of 6, 14, 24, place 0 and 24 together at any of the points of distance measured off, say 240 yards. Stretch six in the direction of the measured line and 14 at either side of the measured line till there is an equal strain from 14 to 0 and 6. Then a picket placed at 12 will give an angle of 45° with the measured line. The same should be done at the other side of the line, and then covering pickets with the pickets just placed and the point of distance on the measured line.



The instructor should then order one of the brigade-markers to gallop out over the distance of 240 yards, reporting the number of paces of his horse, as usual, and then turning his horse half-right or half-left, as the case may be, gallop out the same distance in the new direction. Leaving one of his assistants to time him the instructor should place himself at the farthest of the covering pickets *c* or *d*, in the opposite direction to the one in which the marker has been ordered to move, from

which point he will be able to see if the marker has judged the angle correctly, and if not, correct him, and repeat the movement; but a very few trials will be found sufficient, as it is by no means difficult to judge an angle of 45° approximatively. A marker might be placed mounted or dismounted at the picket *a* or *b*, nearest to the point of distance, to assist the instructor in correcting the angle judged, while he places himself at the covering picket *c* or *d* as before.

Advance or Retreat of the Division or Brigade.
Battery-Markers.

In the advance or retreat of the line, line of columns, contiguous, or at deploying distance, advance of a base of formation during the formation by deployment, echellon, or otherwise, the battery-markers take up successive points at distances of 480 yards (120 paces or strides of the horse at the gallop out) or 360 yards (90 paces or strides), according as the brigade is composed of cavalry or infantry, which will give the successive positions of the artillery at 240 yards and 180 yards respectively. The first points taken up by the battery-markers will be at the latter distances from the division or brigade about to advance or retire 240 yards (60 paces or strides), 180 yards (45 paces or strides), respectively. If the artillery should be ordered into action while the division or brigade is on the move, No. 1 battery-marker will take up a distance of 240 or 180 yards, and No. 2 battery marker of 480 or 360 yards, according as the division or brigade is composed of cavalry or infantry.

Advancing or Retiring by Alternate Bodies.
The Advance—Infantry.

The battery-markers take up successive points at distances of 360 yards (90 strides), or 120 yards (30 strides),

according as the artillery is working, at the walk or the gallop.

The first point taken up will be at half these distances respectively.

Retiring—Cavalry.

The battery-markers take up successive points at distances of 240 yards (60 strides), and 480 yards (120 strides), according as the movement is made by the cavalry, at the walk or the trot. The first point taken up will be at half the above distances respectively.

Infantry.

The battery-markers will take up successive points at distances equal to 360 yards (90 strides), or 120 yards (30 strides), according as the artillery is working, at the walk or the gallop.

The first point taken up will be at half these distances respectively.

Change of Front—Brigade-Markers.

The brigade-marker, on the reverse or wheeling flank, will move out a distance straight to his front equal in strides or paces of his horse, at the gallop out, to one-tenth of the extent of front of the division or brigade in yards; that is to say, if the extent of front equals 400 yards, he will take 40 strides; of 500 yards, 50 strides; of 600 yards, 60 strides; and so on. This is evidently founded upon the fact that the tangent of 22° 30″ is equal in practice to four-tenths of the radius, which is here represented by the extent of front, and that each stride of the horse at the gallop out equals 4 yards. He will then halt for a moment, turn his horse on the forehand half a right angle, and gallop out an equal distance in the new direction, halt, and hold up his sword. The brigade-

marker, on the pivot-flank or hand wheeled to, when required to give a point, will turn his horse on the forehand an angle of 45°, or half right, gallop out a distance equal to the consecutive positions between the artillery when advancing or retiring in line, according as the division is composed of cavalry or infantry, halt, and hold up his sword.

Battery-Markers.

Battery-markers give points as explained in the instructions.

Second Lines—Change front Half Right.

The right brigade-marker of the second line covers the point of the first line upon which the change is about to be made; turns his horse to the left, and gallops out a distance equal to the distance between lines. He then halts, places his horse again perpendicular to the direction of both lines; then turns his horse half right on the forehand and gallops out a distance equal to one-tenth of the distance between lines in yards, counted in paces or strides of his horse. That is, if the distance between lines should equal 400 yards, 40 strides; if 200 yards, 20 strides, &c.

If the change should be to the right, the right brigade-marker of the second line covers upon the point of the first line upon which the change is about to be made, turns his horse to the left, and gallops out a distance equal to the distance between lines; he then halts, turns his horse to the right on the forehand, and gallops out an equal distance to the front. The covering point in rear of the point upon which the change is made being thus given at the correct distance, the points of alignment can be at once taken up, and the second line can move into the new position as rapidly as possible. If the change should be to the left hand the same holds good, substituting left for right, and *vice versâ*.

Advance and Retreat of the Division or Brigade supported by Artillery.

"The division or brigade will advance."

"Artillery in action."

Repeated by officers commanding brigades and batteries.

1st Case.—From the Halt.

Both batteries limbered up.

"No. 1 battery to the front."

"No. 2 battery action front."

Upon the signal being given No. 2 battery comes into action front. No. 1 battery advances to the point given by the battery-marker at the pace ordered and comes into action front.

The first shot from No. 1 battery will be the signal for No. 2 battery to limber up, move to the point given by the battery-marker at the pace ordered and come into action front. The first shot from No. 2 battery will be the signal for No. 1 battery to limber up, and so on, by batteries in succession, during the advance of the division or brigade.

In the meantime, the cavalry or infantry division or brigade will have received the word, "The division or brigade will advance," also the caution for the pace, and upon the signal of execution being given, the word, "March."

2nd Case.—From the Halt.

Both batteries in action.

"No. 1 battery to the front."

No. 1 battery ceases firing, limbers up, moves to the point given by the battery-marker at the pace ordered, and comes into action front. The first shot from No 1 battery will be the signal for No. 2 battery to limber up, move to the point given by the battery-marker at the pace ordered, and come into action front.

The first shot from No. 2 battery will be the signal for No. 1 battery to limber up, and so on by batteries in succession, during the advance of the division or brigade.

In the meantime, the cavalry or infantry divisions or brigade will have received the word, "The division or brigade will advance," also the caution for the pace, and upon the first shot being fired from No. 1 battery, the word, "March."

On the Move.

During the advance of the division or brigade the general word will be given, "Artillery in action," repeated by officers commanding brigades and batteries.

No. 1 battery will receive the word, "No. 1 battery to the front," and No. 2 battery the word, "No. 2 battery to the front," and upon the signal of execution being sounded, both batteries move to the points given by the respective battery-markers at the pace ordered, and come into action front. The first shot from No. 2 battery will be the signal for No. 1 battery to limber up, move to the new point given by the battery-marker at the pace ordered, and come into action front.

The first shot from No. 1 battery will be the signal for No. 2 battery to limber up, and so on by batteries in succession, during the advance of the division or brigade.

The Attack.—Cavalry.

The cavalry can take up the trot at any position of the artillery, but their doing so will be a signal to the artillery in that position that they are not to continue the advance by alternate batteries. Upon arriving at or near the next and last position of the artillery, the cavalry will receive the word, "Gallop"; after which the pace will be increased, and the attack made. The artillery will then act, according to orders previously given, by joining the supporting line,

or otherwise; one or two squadrons can move on the outward flanks of the artillery and act as escort, and upon the line of cavalry passing the last position of the artillery, they may act on the flanks of the cavalry, either by protecting the flanks, or by making a flank attack, at the same time leaving a sufficient escort with the artillery, if necessary.

Attack supported by Three or more Batteries.

The words of command, &c., for No. 1 and No. 2 batteries will be the same as in the last movements; No. 3 battery will get the word—

"720 yards to the front for action."

"Trot."

The first shot from No. 1 battery will be the signal for No. 3 battery to limber up, trot 720 yards to the front, and come into action.

In this case the trot can be taken up by the cavalry at the second position of the artillery.

But the trot may be taken up at the first position of the artillery as follows:—

Upon the signal being given for No. 1 battery to advance and No. 2 battery to come into action, No. 3 battery will limber up, trot 720 yards to the front, and come into action front.

Or, the cavalry may advance at the trot as follows:—

"No. 1 battery, 240 yards to the front for action."

"No. 2 battery, 480 yards to the front for action."

"No. 3 battery, 720 yards to the front for action."

"Gallop out."

Upon the signal being given, the three batteries move off together as ordered.

In this case, the coming into action of No. 1 battery should, if possible, be protected by a fourth battery; or, if

not, No. 1 battery must work by half batteries, one half battery protecting the coming into action of the other.

The first shot from the artillery in the first position will be the signal for the cavalry to advance at the trot, the gallop being taken up at the second position.

The last movements would be only applicable if the cavalry had a large open plain to work upon, with a clear advance of a thousand yards or so; but such a case might occur in India or elsewhere, and the long range of the artillery would be effective during the advance, and the artillery could be worked while the cavalry were forming on the move; it will be observed that the third battery, although ordered to advance over 720 yards, is not isolated from the protection of the cavalry which is advancing also.

Retiring.

"The division or brigade will retire."

"Artillery in action."

Repeated by officers commanding brigades and batteries.

1*st Case.*—Both batteries limbered up.

"No. 1 battery to the rear."

"No. 2 battery action front."

Upon the signal of execution being given, No. 2 battery reverses, retires to the point given by the battery-marker at the trot, and comes into action rear.

The first shot fired by No. 1 battery will be the signal for No. 2 battery to cease firing rear, limber up, move to the point given by the battery-marker at the pace ordered, and come into action rear.

The first shot from No. 2 battery will be the signal for No. 1 battery to cease firing and limber up, and so on by batteries in succession during the retreat of the division or brigade.

In the mean time the cavalry or infantry brigade will have received the word, "The division or brigade will

retire," also the caution for the pace; and upon the signal of execution being given, the word—

"About," and "March."

2nd Case.—Both batteries in action.

The only difference in this case is, that No. 1 battery will cease firing rear, limber up and move to the point given by the brigade-marker, as in the last case, while No. 2 battery remains in action; in all other respects the movement is the same as in the last case. Each battery in succession will open fire as the retiring line of cavalry or infantry reaches it and clears the front.

In retiring, the trot can be taken up by the cavalry at any position of the artillery, as explained in the advance. By a reference to the cavalry and infantry regulations it will be seen that both in the advance and retiring these movements of the artillery can be applied to all formations on the move, and all movements, whether by column, fours, or otherwise, in which there is a moving base, the pace of such base being regulated as above described. The movements of the advance or retreat can be made as above described, whether the artillery is working on one or both flanks of the division or brigade; but in the first case a slight increase in the pace of the artillery is required, and the movement in advance should be commenced by the battery furthest from the flank of the division or brigade, and *vice versâ* in the retreat.

The paces to be employed in these movements will be as follows:—

Artillery working with cavalry.

Cavalry walk.

Artillery gallop out.

Artillery working with infantry.

Infantry quick time.

Artillery gallop.

Advancing and Retiring by Alternate Bodies.

The Advance—Infantry in skirmishing order or in line formation.

"Fire and advance by brigades, battalions, or half battalions."

"Artillery in action."

1*st Case.*—Both batteries limbered up.

"No. 1 battery to the front for action."

"No. 2 battery action front."

Upon the signal of execution being given No. 1 battery moves to the point given by the battery-marker at the pace ordered, and comes into action front. No. 2 battery comes into action front. Skirmishers of even numbers of brigades, battalions, or half battalions, commence firing.

The first shot from No. 1 battery will be the signal for No. 2 battery to cease firing, limber up, advance to the point given by the battery-marker at the pace ordered, and come into action front, and also for the even numbers of brigades, battalions, or half battalions to cease firing, and for the odd numbers to receive the word, "Quick march"; or signal to advance: odd numbers of brigades, battalions, or half battalions, when arrived in line with the advanced battery, will "Halt," and the even numbers will receive the word, "Quick march," or signal to advance, upon which the odd numbers commence firing. The first shot from No. 2 battery will be the signal for No. 1 battery to cease firing, limber up, move at the pace ordered to the point given by the battery-marker, and come into action front; and also for the odd numbers of brigades, battalions, or half battalions to cease firing. The movement will proceed as above described, in skirmishing order up to about 500 yards from the enemy and then in line forma-

tion until the assault with the bayonet may be given, the artillery will join the supports, or otherwise, as ordered upon the line formation being taken up. It will be observed, that while the even numbers of brigades, battalions, or half battalions are firing No. 1 battery is advancing to the front, and that while the odd numbers are firing No. 2 battery is advancing to the front, consequently the advancing battery will be a brigade, battalion, or half battalion distance to the right or left of the troops whose rifles are in action. The paces to be employed in these movements will be as follows:—

Distance between the successive positions of the artillery and alternate lines of infantry—

180 yards (216 paces).
Artillery walk.
Infantry quick time.

Distance between the successive positions of the artillery and alternate lines of infantry—

60 yards (72 paces).
Artillery gallop.
Infantry quick time.

Retiring by alternate bodies—Cavalry.

"The division or brigade will retire by alternate squadrons."

"Artillery in action."

1*st Case.*—Both batteries limbered up.

Nos. 1 and 2 batteries "action front."

The cavalry will retire by alternate squadrons.

The caution for the pace will then be given, and upon the signal of execution being given, Nos. 1 and 2 batteries come into action front; the even numbers of squadrons go about and retire at the pace ordered to the point given by No. 1 battery-marker; halt and front. Upon the even

numbers being halted and fronted, No. 1 battery ceases firing rear, limbers up, moves to the point given by the battery-marker, and comes into action rear. Also the odd numbers of squadrons go about and retire to the point given by No. 2 battery-marker, halt and front. The first shot from No. 1 battery will be the signal for No. 2 battery to cease firing rear, limber up, move to the point given by the battery-marker, and come into action rear. The first shot from No. 2 battery will be the signal for No. 1 battery to cease firing rear, limber up, &c., and so on by batteries in succession during the retreat of the division or brigade, the alternate lines halting and fronting at the points given by the battery-markers. Each battery in succession should open fire at the moment that the retiring line comes in alignment with the halted line.

Pace—120 yards distance between the successive positions of the artillery and the alternate lines of the cavalry.

Artillery trot.

Cavalry walk.

240 yards' distance between the successive positions of the artillery and the alternate lines of the cavalry.

Artillery gallop out.

Cavalry trot.

2nd Case.—Both batteries in action.

Upon the signal of execution being given, No. 1 battery ceases firing, and rear limbers up.

Upon which the even numbers of squadrons go about, and receive the word, "March"; in other respects, the movement proceeds as described in the 1st Case. No. 1 battery retiring 120 yards, No. 2 battery 240 yards, if the movement is effected by the cavalry at the walk, and No. 1 battery 240 yards, and No. 2 battery 480 yards, if the movement is effected by the cavalry at the trot.

Retiring by alternate bodies—Infantry.

"The division or brigade will fire and retire by brigades, battalions, or half battalions."

"Artillery in action."

1*st Case.*—Both batteries limbered up.

"No. 2 battery to the rear for action."

"No. 1 battery action front."

Upon the signal of execution being given, the skirmishers of odd numbers of brigades, battalions, or half battalions, commence firing, No. 2 battery reverses moves to the point given by the battery-marker, and comes into action rear, even numbers of brigades, battalions, or half battalions, fire, load, retire to the point given by No. 2 battery-marker, and halt front. Upon the halting and fronting of the even numbers, the odd numbers of brigades, battalions, or half battalions, cease firing, retire to the point given by No. 1 battery-marker, and halt front. The first shot from No. 2 battery will be the signal for No. 1 battery to cease firing rear, limber up, move to the point given by the battery-marker, and come into action rear, and also for the even numbers of brigades, battalions, or half battalions, to commence firing. The same remark with reference to the artillery and the rifles in action is applicable in this case as well as in the advance. Upon the odd numbers of brigades, battalions, or half battalions, approaching the point given by No. 1 battery-marker, the "cease firing" is sounded for the infantry, and, upon the halting and fronting of the odd numbers, the even numbers go about, retire to the point given by No. 2 battery-marker, and halt front, and so on in succession during the retreat of the division or brigade; as in the former cases, each battery in succession opens fire as the retiring line comes into alignment with the halted line. If within 500 yards, the movement may be made as

in the advance in line formation, unsupported by the artillery; it will also be obvious that the movement may be effected by any arrangement of the skirmishers working by alternate lines.

Pace.—When the distance equals 180 yards (216 paces).

Artillery walk.

Infantry quick time.

When the distance between the successive positions of the artillery and the alternate lines of infantry equal 60 yards (72 paces).

Artillery gallop.

Infantry quick time.

2nd Case.—Both batteries in action.

Upon the signal of execution being given, No. 1 battery limbers up, retires to the point given by the battery-marker, and comes into action rear.

Upon the limbering up of No. 1 battery being completed, even numbers of brigades, battalions, or half battalions, fire a volley and retire; in all other respects the movement proceeds as already described.

Change of Front—Brigade advancing in Line.

Artillery on both flanks—No. 1 battery on the right, No. 2 battery on the left.

Change of Front—Half Right.

1st Case.—No. 1 battery in advance. Before reaching the position of No. 2 battery, the caution will be given, "The brigade will change front—half right;" "Artillery in action," repeated by officers commanding regiments and batteries. The caution should also be communicated to the officer in command of the advanced battery, if necessary, by an officer sent forward for that purpose.

Upon reaching the position of No. 2 battery, the signal

of execution will be given and the movements for changing front, as laid down in the Regulations, will be commenced by the cavalry or infantry brigade.

Upon No. 1 battery opening fire, No. 2 battery receives the word—

"Front limber up—Trot, Gallop, or Gallop out, March."

The marker of No. 2 battery will, upon the battery receiving orders to limber up, gallop forward to the point given by the left brigade-marker, replace him, and hold up his sword.

No. 2 battery, upon arriving at the point given by the battery-marker, receives the word, "Halt—action front."

Upon No. 2 battery opening fire, No. 1 battery will get the word—

"Limber up—Trot, Gallop, or Gallop out, March."

The officers commanding No. 2 battery will move by half batteries, divisions, or sub-divisions, according to the nature of the ground.

Upon No. 1 battery receiving the order to limber up, the battery-marker gallops to the point given by the right brigade-marker, replaces him, and holds up his sword.

No. 1 battery, upon arriving at the point given by the battery-marker, receives the word, "Halt—action."

The change of front to the right will only involve a repetition of the movements already indicated.

Division or Brigade advancing in Line.

Artillery on both flanks.

No. 1 battery on the right, No. 2 battery on the left.

Change Front—Half Right.

2nd *Case.*—No. 2 battery in advance. The caution to be given as in the first case. Upon reaching the position of No. 1 battery, the signal of execution will be given, and the movements for changing front, as laid down in the Regulations, will be commenced by the cavalry or infantry brigades.

Upon No. 2 battery opening fire, No. 1 battery will receive the word—

"Front limber up—Trot, Gallop, or Gallop out, } March."

Upon No. 1 battery receiving the order to limber up, the battery-marker will gallop to the point given by the right brigade-marker, replace him, and hold up his sword.

No. 1 battery, upon arriving at the point given by the battery-marker, receives the word, "Halt—action."

Upon No. 1 battery opening fire, No. 2 battery receives the word—

"Front limber up—Trot, Gallop, or Gallop out, } March."

Upon No. 2 battery receiving the order to limber up, the battery-maker will gallop forward a distance in the new direction taken from the point given by the left brigade-marker, equal to the usual distance between the positions of the artillery when advancing in line, halt, and hold up his sword.

No. 2 battery, upon arriving at the point given by the battery-marker, receives the word, "Halt—action."

Upon No. 2 battery opening fire, No. 1 battery receives the word—

"Front limber up—Trot, Gallop, or Gallop out, } March."

Upon No. 1 battery receiving the order to limber up, the battery-marker gallops forward a distance equal to the distance between the positions of the artillery when advancing in line, halts, and holds up his sword.

No. 1 battery, upon arriving at the point given by the battery-marker, receives the word, "Halt—action front."

The brigade will then be in a position to advance in line as usual, artillery in action. If the caution should be given to "Change front to the right" it will only involve a repetition of the movements just indicated, except that the battery-marker of No. 1 battery, instead of galloping forward a distance equal to the distance between the positions of the artillery when advancing in line, as in the last movement of the change "half right," will gallop to the point given by the right brigade-marker, replace him, and hold up his sword.

Change Front—Half Right.

Artillery on the pivot flank. No. 2 battery in advance.

Upon No. 2 battery opening fire, No. 1 battery receives the word—

"Front limber up—Trot, Gallop, or Gallop out, } March."

The marker of No. 1 battery, upon the battery receiving the word, "Front limber up," will gallop to the point given by the brigade-marker, replace him, and hold up his sword.

No. 1 battery upon arriving at the point given by the battery-marker receives the word, "Halt—action front."

Upon No 1 battery opening fire, No. 2 battery receives the word—

"Limber up—Trot, Gallop, or Gallop out, } March."

The marker of No. 2 battery upon receiving the word "Limber up" will gallop round the rear of No. 1 battery, then a distance in advance counted by strides of his horse, equal to the distance between the positions of the artillery during the advance in line, halt, and hold up his sword.

No. 2 battery moves round the rear of No. 1 battery, and when arrived at the point given by the marker receives the word, "Action front."

The brigade will then be in a position to advance in line in the usual manner, artillery on the right flank.

Change Front to the Right.

This will only involve a repetition of the movements indicated in the change "Half right," with the following exception, viz.—

The marker of No. 2 battery, upon the battery receiving the word "Limber up" will, instead of galloping round the rear of No. 1 battery, and then in advance gallop by the rear of No. 1 battery to the point given by the brigade-marker, replace him, and hold up his sword.

Change Front—Half Right.

Artillery on the reverse flank.

No. 2 battery in advance. Upon No. 2 battery opening fire, No. 1 battery will receive the word—

"Front limber up—Trot, Gallop, or Gallop out, } March."

Upon the battery receiving the word to "Limber up," the battery-marker will gallop forward to the point given by the brigade-marker, replace him, and hold up his sword.

Upon the battery reaching the point given by the battery-marker, the word will be given "Halt—action." Upon No. 1 battery opening fire, No. 2 battery will receive the word—

"Front limber up—Trot,
Gallop, or } March."
Gallop out,

Upon the battery receiving the order to "Limber up" the battery-marker will gallop to a point in advance of the battery in action, at a distance equal to the usual distance when advancing in line, halt, and hold up his sword.

The battery, upon reaching the point given by the battery-marker, will receive the word "Halt—action."

The change of front to the right will only involve a repetition of the movements already indicated.

The battery will advance by columns of half batteries, divisions, or sub-divisions, according to the ground or judgment of the officer commanding the battery, and then pass in rear of the advanced battery in action, in front of the advancing cavalry, for which there will be room.

APPENDIX.

NOTE 1.

Let x equal the distance between the successive positions of the artillery t, the time occupied in limbering up and coming into action of each battery. V, the velocity of the artillery in passing from one position to another, and V′, the velocity with which the line of infantry or cavalry, or the base during a formation of either arm moves.

$$\frac{x}{V'}=\frac{2x}{V}+t, \qquad (1)$$

$$\frac{x}{V'}=\frac{2x+Vt}{V},$$

$$Vx=2V'x+V'Vt,$$

$$x=\frac{V'V}{V-2V'}t$$

Putting the above expression in the form

$$x=\left\{V'\frac{V-2V'}{V-2V'}+\frac{2V'^2}{V-2V'}\right\}t,$$

$$x=\left\{V'+\frac{2V'^2}{V-2V'}\right\}t.$$

It will be evident that x varies directly with t and V′, and inversely with V.

If $t=0$, expression (1) becomes

$$\frac{x}{V'}=\frac{2x}{V},$$

$Vx=2V'x$, and whatever may be the value of x;

$V=2V'$.

NOTE 2.

Advancing or Retiring by Alternate Bodies.

In this case x, the distance between the successive positions of the artillery is passed over twice, once by each line or advancing or retiring body in succession, which is equivalent in time to passing over x once at half the given velocity; therefore, in this case, we must substitute one half V′ for V′, in expression (1), which becomes

$$\frac{2x}{V'}=\frac{2x}{V}+t,$$

$$x=\frac{V'V}{2(V-V')}t.$$

It will be evident that, in this case also x varies directly with V′ and t, and inversely with V.

If $t=0$,

$$\frac{2x}{V'}=\frac{2x}{V},$$

$$V=V,$$

whatever may be the value of x.

NOTE 3.

Infantry Firing and Advancing by Alternate Bodies.

Let t' equal the time occupied in firing a volley and loading.

Advancing.

In this case $\frac{2x}{V'}$, the time occupied by each line in advancing, is available for the loading of the halted line. *See* "Infantry Regulations," s. 8, para. i., page 223.

Therefore, when $\frac{2x}{V'}$ equals or exceeds t', the expression remains as in Note 2,

$$\frac{2x}{V'}=\frac{2x}{V}+t,$$

$$x=\frac{V'V}{2(V-V')}t.$$

Taking the rifle firing at one shot in five seconds, the loading would be effected while the advancing line was advancing at the quick time over about eight yards; therefore, in the advance, we may leave the quantity t' out of consideration in the calculation. Also, the time from the moment that the rear line gets the word "Quick march" to the moment that the rear line comes into alignment with the advanced line, is available for the fire of the advanced line. This, with breech loaders, would give over thirty shots from each rifle when the artillery is working at the walk, seven or eight when the artillery is working at the gallop.

Retiring.

When the muzzle loaders were in use, each line loaded before retiring, and the halting of the rear line was the signal for the advanced line to fire. *See* "Infantry Regulations," s. 8, para. ii., page 224. The loading then occupied about half a minute, and it was therefore necessary to take it into consideration, and to substitute $(t-t')$ for t in the expression in Note 2, which would then become

$$\frac{2x}{V'} = \frac{2x}{V} + t - t',$$

$$x = \frac{V'V}{2(V-V')}(t-t').$$

But, now that breech loaders are in use, loading occupies so short a time (about five seconds) that, when working with artillery, there is not only time for loading, but also for file firing, during the retreat, and it will only be necessary for the commandant of the advanced line to watch the retreat of the rear line to time his movements, so as to cease firing and have his men loaded at the moment that the rear line halts and fronts. Therefore, in this case also, the formula may remain

$$x = \frac{V'V}{2(V-V')}t.$$

NOTE 4.

Passage from Column to direct Echellon on the Move.

Let F equal the frontage of the column, V′ the velocity of the base of formation, and V the velocity of the remaining ranks of the

column, d the echellon distance, and d' the original distance in column, n the number of ranks in the column, and T the time occupied in the movement, S′ the space passed over by the leading rank of the column during the movement.

$$d=\frac{F}{V}V'+d', \qquad \frac{(n-1)F}{V}=T, \qquad S'=TV'.$$

If the movement is made while the leading rank remains halted, d evidently equals d'.

NOTE 5.

Let a body be supposed to pass over any given distance, S, in any given time; one part of such distance, $\frac{S}{g}$, with the velocity V, and the other part, $\frac{S}{h}$, at a greater velocity, mV: to find the uniform velocity, nV, at which the body would pass over the same distance in the same time.

$$\frac{S}{gV}+\frac{S}{hmV}=\frac{S}{nV},$$

$$\frac{hm+g}{g.h.m}=\frac{1}{n},$$

$$\{hm+g\}n=g.h.m,$$

$$n=\frac{g.h.m}{h.m+g}.$$

The slower velocity multiplied by n will give the uniform velocity.

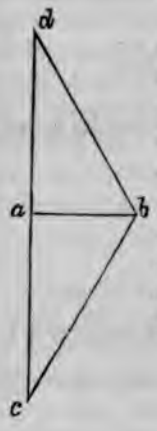
If the parts of the distance, S, passed over at the different velocities are equal n and g, each equal 2, and

$$n=\frac{4m}{2m+n}.$$

Having thus found the uniform velocity corresponding to the accelerated velocity, it will be only necessary to put it in each of the formulæ for the velocity of the arm moving at the accelerated velocity.

NOTE 6.

Both Batteries working on One Flank.



Let a represent the distance $c\,a$ or $a\,d$ between the consecutive positions of the artillery on the direct line; $b = c\,b$ or $b\,d$, one-half the distance to be passed over by the battery in the rear position, on the oblique lines, in order to clear the outer flank; b of $a\,b$ the battery in action, V the velocity of the artillery when moving on the direct line, and nV the velocity with which it will be necessary the artillery should move upon the oblique lines $c\,b$, $b\,d$; the extent of front of the battery in action, equals 100 yards.

$$a : b :: \mathrm{V} : n\mathrm{V}.$$

$$a : \sqrt{a^2+10000} :: 1 : n.$$

$$\frac{\sqrt{a^2+10000}}{a} = n.$$

In the advance and the retreat of the cavalry, protected by the horse artillery, it has been already shown that the distance between the consecutive positions of the artillery on the direct line must equal 240 yards, and the velocity of the artillery about 16 miles an hour. Therefore, in this case,

$$\frac{\sqrt{a^2+10000}}{a} = n.$$

$$= \frac{\sqrt{57600+10000}}{240} = n$$

$$= \frac{\sqrt{67600}}{240} = n$$

$$= \frac{260}{240} = 1{\cdot}08 = n;$$

$\therefore\ n\mathrm{V} = 1{\cdot}08 \times 16 = 17{\cdot}28$ miles per hour.

In the advance and retreat of the infantry, protected by artillery, the distance between the consecutive positions of the artillery equals 180 yards. Therefore, in this case,

$$\frac{\sqrt{a^2+10000}}{a} = n$$

$$= \frac{\sqrt{32400+10000}}{180} = n$$

$$=\frac{\sqrt{42400}}{180}=\frac{206}{180}\text{ \&c.}=1{\cdot}14=n.$$

Taking V at the rate of 16 miles an hour, $n=1{\cdot}14\times16=18{\cdot}24$ miles per hour. Taking V at the trot, 12 miles per hour, $1{\cdot}14\times12=13{\cdot}68$ miles per hour.

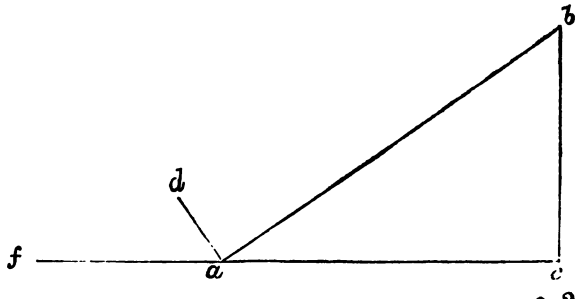
NOTE 7.

To find the Number of Miles per Hour corresponding to any given Velocity expressed in Yards and Seconds.

If V equals the number of yards per second at which a body moves, 60V will evidently equal the number of yards per minute, and 60^2V the number of yards per hour at which such body should move. 60^2V divided by 1760, the number of yards in a mile, will evidently give the number of miles per hour at which the body should move $60^2=3600$. Therefore $\frac{60^2}{1760}=\frac{3600}{1760}$, which may be taken equal to 2·0454. Therefore, if n be taken to express the number of miles per hour corresponding to the velocity V in seconds, $n=2{\cdot}0454$V. Therefore, as an approximation for practical purposes, twice the number of yards per second may be taken as expressing the number of miles per hour at which a body moves, and *vice versâ.*

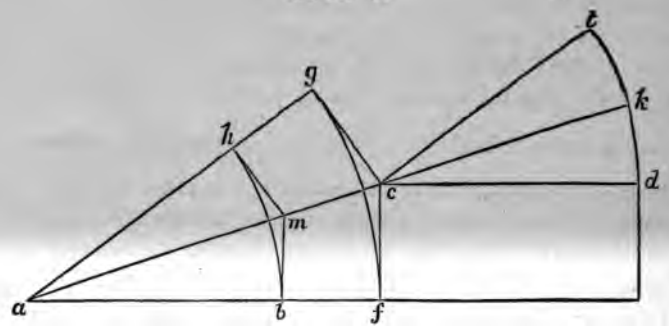
NOTE 8.

Oblique Echellon.



The distance advanced is to the distance gained to a flank as radius to tan. of angle wheeled. Let *a b* represent the line of movement of *a d*, the leading echellon of the line; *c b* the distance gained to the front, and *a c* the distance gained to a flank in any given time. The angles *f a d*, *a b c*, are evidently complements of the same angle *b a c*, and consequently equal to each other, but *d a f* is the angle wheeled from line into oblique echellon, and *a c* is the tangent of the angle *a b c* to radius *c b*.

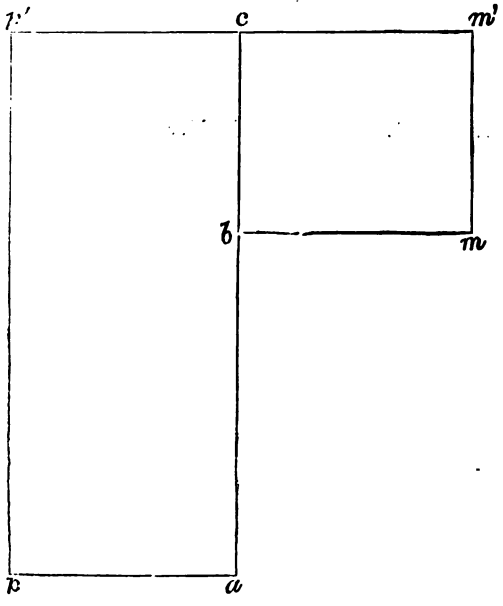
NOTE 9.



Let *a b* and *c d* represent two squadrons in direct echellon, right in front, at distance *f c*, and with the interval *b f*. If we suppose the squadrons to wheel into the line *a c k*, and then forward an equal angle so as to place them again in direct echellon *a h c t*, left in front, the distance and interval will remain correct. For the triangles *a h m*, *a b m*, also the triangles *a g c*, *a f c*, are equal, having a common side and two angles equal; therefore the sides *f c*, *c g*, which represent the distances, are equal, and also the differences of the other two sides *b f*, *h g*, which represent the intervals. It will be evident that line can be formed with correct intervals from the echellon in the new direction.

NOTE 10.

Formations to Line from Direct Echellons on the Move.



Let m represent the leading echellon or base of formation, p the rear echellon or last rank in the formation, $m\,m'$ and $p\,p'$ the lines of movement of these bodies respectively, m' and p' the points in the lines of movement at which they came in alignment with each other. It will be evident that $b\,c$ represents the distance passed over by the leading echellon, and $a\,c$ the distance passed over by the rear echellon during the formation to line on the move. Take D equal to $a\,b$, which must represent the difference between them whatever they may be, also S′ to represent $b\,c$, and S to represent $a\,c$, T the time during which both bodies are in movement before coming into line, V′ the velocity of the leading echellon, and V the velocity of the rear echellon.

$$T=\frac{S'}{V'}=\frac{S}{V},$$

$$S' : V' :: S : V,$$

$$S' : S :: V' : V,$$

$$S' : (S-S') :: V' : (V-V'),$$

$$S'=\frac{V'}{V-V'}(S-S')=\frac{V'}{V-V'}D,$$

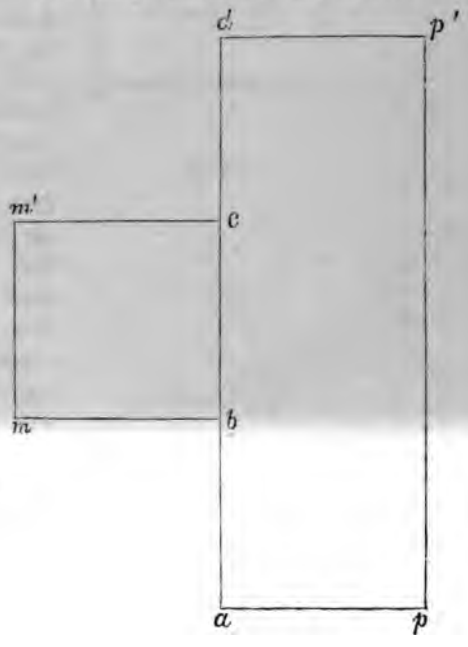
$$S=\frac{V}{V-V''}D.$$

Let d=the echellon distance, $(n-1)d$=D.

If the formation should be made on a halted base, D V will evidently equal the time occupied in the movement.

NOTE 11.

Reversing the Echellon on the Move.

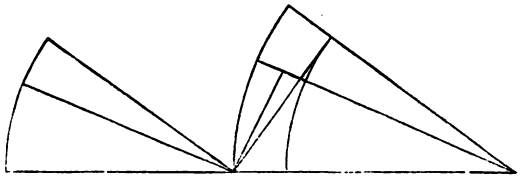


In this case $a\,b+c\,d$ will represent the difference of the distances passed over by the leading and rear rank during the movement; therefore

Taking
$$D=ab+cd,$$
$$S'=\frac{V'}{V-V'}D, \qquad S=\frac{V}{V-V'}D,$$
$$T=\frac{S'}{V'}=\frac{S}{V},$$
$$2(n-1)d=D.$$

NOTE 12.

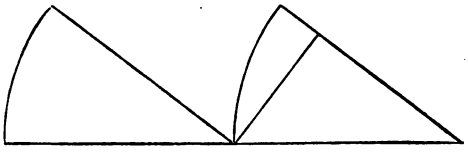
Wheel from Line with Intervals into Direct Echellon.



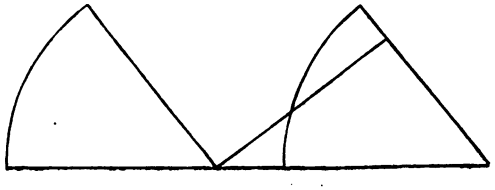
In the wheel forward from line with intervals, the intervals gradually diminish by a distance equal to the verst sine of the angle wheeled, in terms of the extent of front and interval of the wheeling bodies, until the verst sine becomes equal to the original interval, when the formation becomes a formation in direct echellon without intervals. The echellon distance will also equal the sine of the angle wheeled, in terms of the front and interval. This will be apparent by an inspection of the accompanying figure. If the wheel should be continued, the formation would become a formation in oblique echellon.

NOTE 13.

Formation of Oblique Echellon from Line.



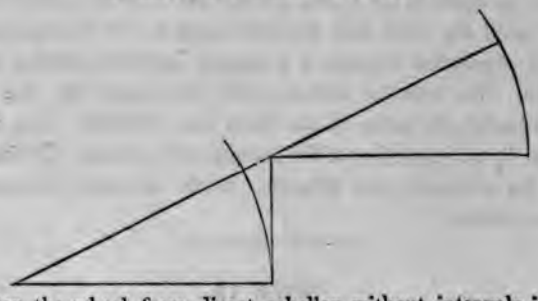
In the wheel into oblique echellon from line without intervals, the distance from the outer flanks to the covering point is equal to the verst sine, the distance from the inner flanks to the same point to the co-sine, and the echellon distance to the sine of the angle wheeled from line into echellon, in terms of the extent of front of the ranks of the echellon.



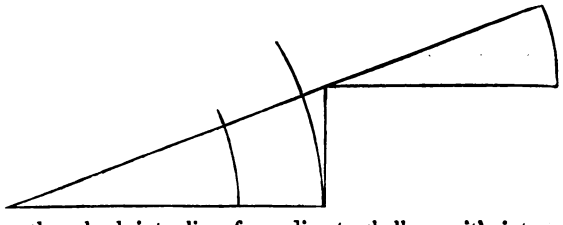
In the oblique echellon formation from line with intervals, the distance from the outer flanks to the covering point is equal to the verst sine, less by the interval and the distance from the inner flanks to the same point to the co-sine, and the echellon distance to the sine of the angle wheeled, in terms of the extent of front and interval. This will be apparent from an inspection of the accompanying figures.

NOTE 14.

Passage from Echellon to Line.



After the wheel from direct echellon without intervals into line with intervals, the intervals will be equal to the difference between the radius and secant, and the distance of the echellon to the tangent of the angle wheeled, in terms of the extent of front of the ranks of the echellon.



For the wheel into line from direct echellons with intervals, to line with increased intervals, the augmentation of the intervals will equal the difference between the radius and the secant, the echellon distance being equal to the tangent of the angle wheeled, in terms of the extent of front and interval. This will be apparent from an inspection of the accompanying figure.

NOTE 15.

Wheel forward into Line from Oblique Echellons.

When the echellon distance equals the sine of the angle wheeled in terms of the extent of front, the line will be without intervals; when the echellon distance exceeds the above, the line will be with intervals equal to the difference of the extent of front and the cosecant of the angle wheeled, in terms of the echellon distance. This will be evident by a reference to figs. 1 and 2, Note 13.

NOTE 16.

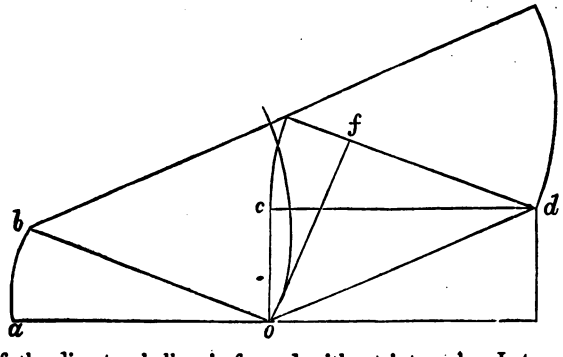
Formation to Line from Direct Echellons by the Forward Movement on the Direct Line.

Let D equal the echellon distance, n the number of ranks of the echellon, T the time occupied in the formation, V the velocity at which the formation is made $(n-1)$, D = the distance passed over by the rear echellon in forming line, and

$$T=(n-1)\frac{D}{V}.$$

NOTE 17.

Passage from Direct to Oblique Echellon, and vice versâ.



If the direct echellon is formed without intervals: Let w = the angle $a\,o\,b = c\,o\,f$ wheeled forward from direct to oblique echellon,

$w' =$ the angle $c\,o\,d$, of which, $c\,o$ the distance in direct echellon is the co-tangent, and $o\,d$ the co-secant to radius $c\,d =$ the extent of front, $w' - w =$ the angle $f\,o\,d$, $o\,f$ the distance in oblique echellon $=$ the co-sine, and $d\,f$ the distance from the inner flank to the covering point the sine of the angle $f\,o\,d$ in terms of $o\,d$. In the subsequent wheel into line from oblique echellon, the intervals in line will equal the difference between $o\,d$ and $c\,d$; this will be apparent from an inspection of the figure. If the direct echellon should be formed with intervals, $c\,d$ will equal the front and interval, and the augmentation of the intervals when wheeled into line from oblique echellons will equal the difference between $o\,d$ and $c\,d$.

NOTE 18.

Change of Front.—Division or Brigade.

In estimating the time occupied by a division, brigade, or other body of troops, in changing front, we must consider the time employed by the body composing the reverse flank in passing from its position in the old line to its position in the new line; or, if the change is effected by a column movement, the time occupied by the rear rank of the column composing the reverse flank in arriving at its place in the new line; for it is evident the change will not be completed till this body is formed in the new direction. The change of front is generally executed either in whole or part by one of the following methods:—

1. By the direct echellon of parts into which the division or brigade may be broken up.
2. By the oblique echellon of the same.
3. By an open column movement from a flank of the parts composing the division or brigade, which move on parallel lines and enter the new line of direction at given points, then move along the line to their points of formation and wheel into line.
4. By an open column movement from a flank of the parts composing the division or brigade which move on parallel lines to their points of formation in the new line and then form by oblique echellon to the front.
5. By an open, close, or quarter-distance column movement of

the parts into which the division or brigade may be broken up, which form column, move to points of formation in the new line, and then deploy.

6. By an open column movement of the whole division or brigade.

Fig. 1.

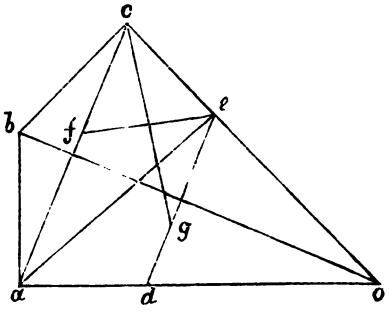
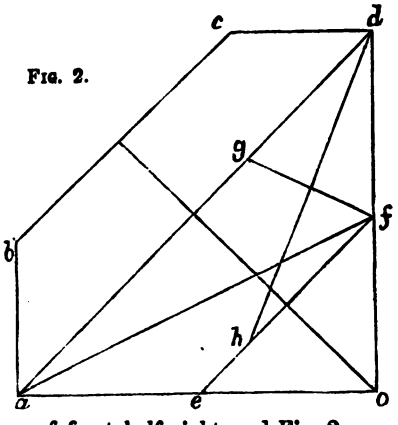


Fig. 2.



Let Fig. 1 represent the change of front half right, and Fig. 2 the change of front to the right.

Case 1.—The body composing the reverse flank moves along the lines

a b, b c, Fig. 1, and
a b, b c, c d, Fig. 2.

Case 2.—The body composing the reverse flank moves along the line

a c, Fig. 1, and
a d, Fig. 2.

Case 3.—The last rank of the column composing the reverse flank moves over the lines

d a, a e, Fig. 1, and
e a, a f, Fig. 2,

a d, c e, a e, f d, respectively representing the extent of front of the body composing the reverse flank when in line.

Case 4.—The last rank of the column composing the reverse flank moves over the lines *d a, a f, f e,* or *a d, d g, g c,* Fig. 1, and *e a, a g, g f,* or *a e, e h, h d,* Fig. 2, *a d, c e, a e, f d,* respectively representing the extent of front of the body composing the reverse flank when in line.

Case 5.—Let X′ equal the extent of front when in line of the columns composing the reverse flank, then the last rank of the column moves over a distance equal to the secant of an angle, whose tangent to radius X′ equals the depth of the column, and also *d e*, *e c*, or *a c*, *c e*, Fig. 1, and *e f*, *f d*, or *a d*, *d f*, Fig. 2, *a d*, *c e*, *a e*, *f d*, respectively representing the extent of front of the body composing the reverse flank when in line.

Case 6.—The last rank of the column composing the division or brigade moves over the distance *a o*, Figs. 1 and 2, but this movement can only be effected when working on the non-pivot system.

Take x to represent the extent of front in yards of the troops of cavalry, or companies of infantry composing the line of the division or brigade about to effect a change of front; n, the number of squadrons or companies in line; w, the angle contained between the old and new lines of front; X, the extent of front in yards of the division or brigade in line; and S, the distance passed over by the reverse flank if the change is effected by the echellon movement, or the reverse flank of the last rank of the reverse flank column if the change is effected by the column movement; m, an arc of the circle to radius unity corresponding to the amount of the angles wheeled by the last-named bodies.

Cavalry, $$X = n2x + (n-1)\frac{x}{2}$$
$$= \frac{5n-1}{2}x.$$

Infantry, $$X = nx.$$

Echellon Movements.

Case 1.—*Half Right.*

$$S = X\ 2 \tan. \tfrac{1}{2}w + 2xm.$$

Amount of angles wheeled $= 45°$.

To the Right.

$$S = X\ 4 \tan. \tfrac{1}{4}w + 2xm.$$

Amount of angles wheeled $= 90°$.

This is upon the supposition that the infantry movement is made by grand divisions.

Case 2.—*Half Right.*

$S = X\ 2 \sin. \frac{1}{2}w + xm.$

Amount of angles wheeled, 45°.

To the Right.

$S = X\ 2 \sin. \frac{1}{2}w + xm.$

Amount of angles wheeled, 90°.

Column Movements.

In calculating the column movements during the change of front we must consider the following:—

1st. If we suppose a column moving on any given line of direction; in order to change the line of direction to another at any given angle with the first, it will be necessary that the leading rank and subsequently all the succeeding ranks of the column should wheel an angle equal to the supplement of the given angle formed by the two lines of direction. This will be evident as the angles round any given point equal four right angles, and as the angles made by the ranks of the column with the lines of direction equal two, it follows that the angle wheeled by the ranks of the column in order to execute the change of the line of movement must equal the supplement of the angle formed by the lines of direction.

2nd. The angles wheeled by each rank of a column in forming line by means of the oblique echellon from column must together equal a right angle; the angle wheeled to place the ranks of the column perpendicular to the lines of direction upon which they are to move being the complement of the angle subsequently wheeled by each rank into the line of formation.

Case 3.—Let n' equal the number of squadrons or companies composing the reverse flank column; y the distance along the line $a\,e$, Fig. 1, or $a\,f$, Fig. 2; w' the angle $o\,a\,e$, Fig. 1, or $o\,a\,f$, Fig. 2; w'' the angle $a\,e\,o$, Fig. 1, or $a\,f\,o$, Fig. 2; s half the sum, and d half the difference of these angles; X' the extent of front in line of the number of squadrons or companies about to be thrown into column on the reverse flank, and X'' the depth of the column. X, as before, the extent of front in yards of the division or brigade in line, and w the angle contained between the old and new lines of front. Then in the case of the cavalry

$$\frac{5n'-1}{2}x=X', \text{ and } \frac{5n'-3}{2}x=X'',$$

$$\tan. d=\frac{X'}{2X-X'}\tan. S,$$

$$w=S-d, \qquad w''=S+d,$$

$$\sin. w\frac{X}{\sin. w''}=y,$$

$$S=X'+y+xm.$$

Angles wheeled, $360+w''-w'$.

Case 4.—In this case, when the movement is on the lines $d\,a$, $a\,f$, $f\,e$, Fig. 1, or $e\,a$, $a\,g$, $g\,f$, Fig. 2, each of the angles $o\,a\,c$ and $o\,c\,a$, Fig. 1, and $o\,a\,d$ and $o\,d\,a$, Fig. 2, are evidently equal to $\frac{180°-w}{2}$; and each of the angles $c\,f\,e$, $c\,e\,f$, Fig. 1, and $d\,g\,f$, $d\,f\,g$, Fig. 2, equal $\frac{180+w}{4}$.

$$S=X\ 2\sin. \tfrac{1}{2}w+X'\ 2\sin. \frac{180-w}{4}+xm.$$

Angles wheeled, $\frac{180+w}{2}+180°$.

And when the movement is on the lines $a\,d$, $d\,g$, $g\,c$, Fig. 1, or $a\,e$, $e\,h$, $h\,d$, Fig. 2,

$$S=(X-X')\,2\sin. \tfrac{1}{2}w+X'\,2\sin. \frac{180+w}{4}+xm.$$

Angles wheeled, $\frac{180°-w}{2}+180°$.

Case 5.—In forming open column and subsequently line by oblique echellon, the rear rank of the column passes over a distance equal to $X'\ 2$ sec. $45=2{\cdot}8\ X'$; and in forming quarter-distance column and subsequently deploying over a distance equal to the radius tangent and secant of an angle whose tan.$=\cdot25$ or one-fourth to radius unity multiplied by the extent of front in line$=2{\cdot}28\ X'$. Therefore in the case of the open column,

$$S=(X-X')\,2\sin. \tfrac{1}{2}w+2{\cdot}8\,X'+xm;$$

and in the case of the quarter-distance column,

$$S=(X-X')\,2\sin.\tfrac{1}{2}w+2{\cdot}28\,X'+xm.$$

In both cases the angles wheeled equal w.

Case 6.

$$S=X+xm.$$

Angles wheeled, $180'-w+180=360-w$.

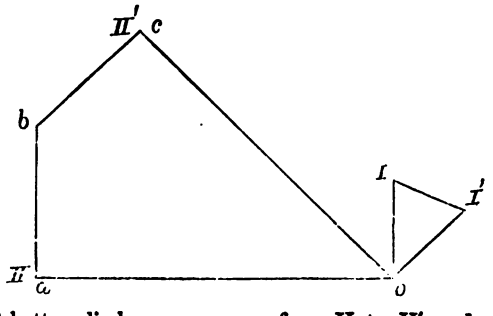
NOTE 19.

Change of Front.—Artillery on both Flanks.

If we suppose a division or brigade to be advancing or retiring in line, artillery on both flanks, taking up successive positions, and that a change of front is required during the movement, it will be necessary to take two cases into consideration—1st case, when the battery which is in advance and in action is on the pivot flank; 2nd case, when the advanced battery is on the reverse or wheeling flank.

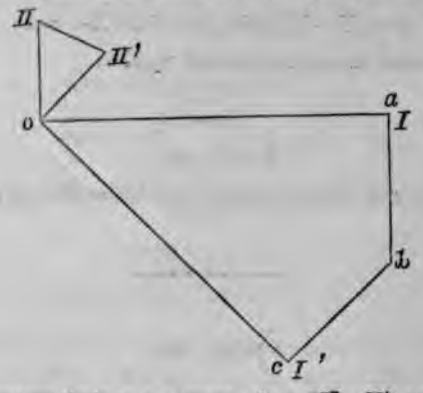
We shall suppose No. 1 battery to be on the right, and No. 2 battery on the left flank.

1st Case.—No. 1 *Battery in Advance.—Half Right.*



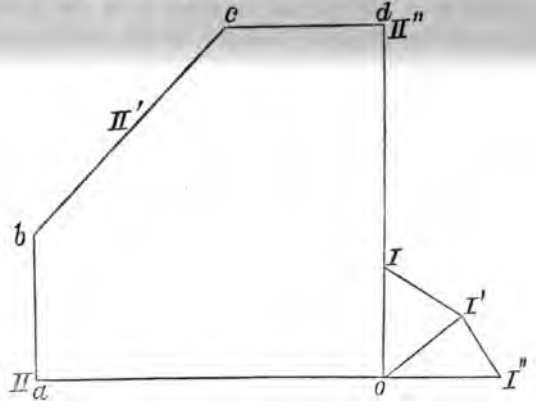
No. 2 battery limbers up, moves from II to II', and comes into action. Upon No. 2 battery opening fire, No. 1 battery limbers up, moves from I to I', and comes into action.

No. 2 Battery in Advance.—Half Right Back.



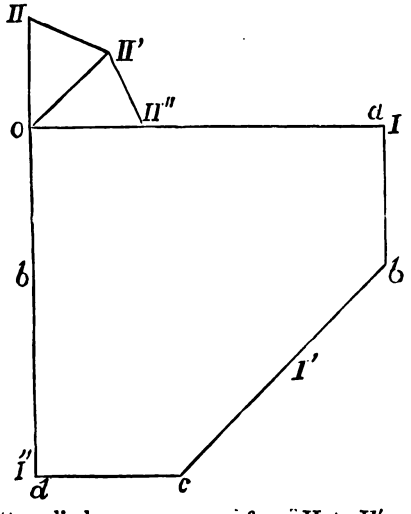
No. 2 battery limbers up, moves from II to II', and comes into action. Upon No. 2 battery opening fire, No. 1 battery limbers up, moves from I to I', and comes into action.

No. 1 Battery in Advance.—To the Right.



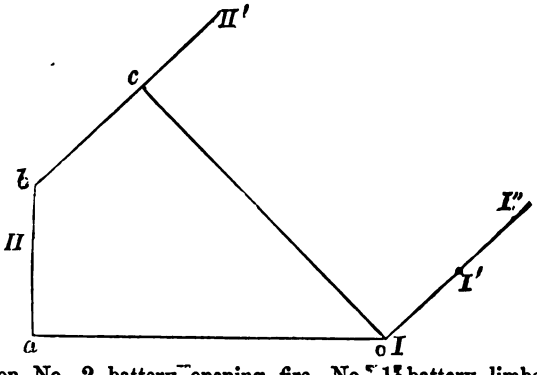
No. 2 battery limbers up, moves from II to II', and comes into action. Upon No. 2 battery opening fire, No. 1 limbers up, moves from I to I', and comes into action. Upon No. 1 battery opening fire, No 2 battery limbers up, moves from II' to II'', and comes into action. Upon No. 2 battery opening fire, No. 1 battery limbers up, moves from I' to I'', and comes into action.

No. 2 Battery in Advance.—Right Back.



No. 2 battery limbers up, moves from II to II′, and comes into action. Upon No. 2 battery opening fire, No. 1 battery limbers up, moves from I to I′, and comes into action. Upon No. 1 battery opening fire, No. 2 battery limbers up, moves from II′ to II″, and comes into action. Upon No. 2 battery opening fire, No. 1 battery limbers up, moves from I′ to I″, and comes into action.

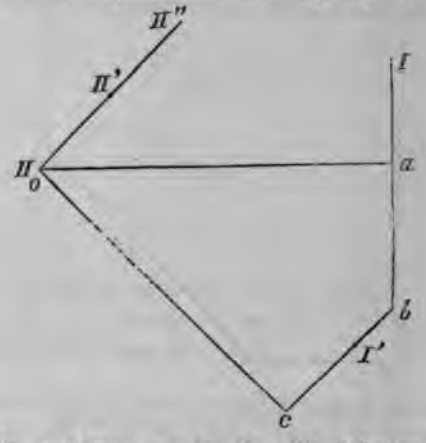
2nd Case.—No. 2 Battery in Advance.—Half Right.



Upon No. 2 battery opening fire, No. 1 battery limbers up, moves from I to I′, and comes into action. Upon No. 1 battery

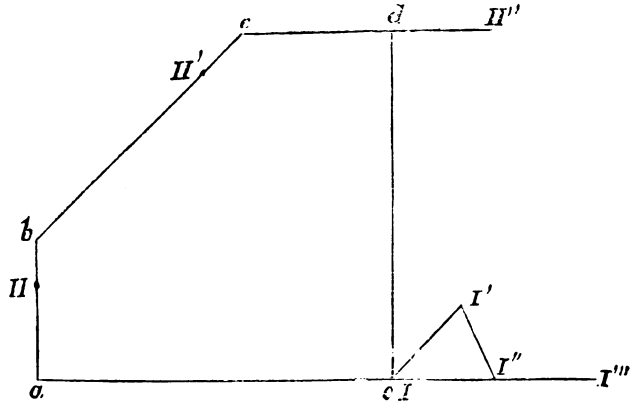
opening fire, No. 2 battery limbers up, moves from II to II′, and comes into action. Upon No. 2 battery opening fire, No. 1 battery limbers up, moves from I′ to II″, and comes into action.

No. 1 Battery in Advance.—Half Right Back.



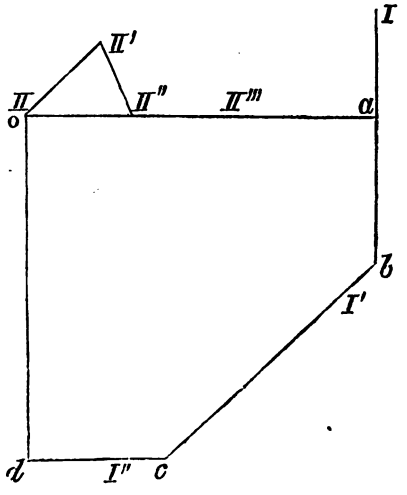
Upon No. 1 battery opening fire, No. 2 battery limbers up, moves from II to II′, and comes into action. Upon No. 2 battery opening fire, No. 1 battery limbers up, moves from I to I′, and comes into action. Upon No. 1 battery opening fire, No. 2 battery limbers up, moves from II′ to II″, and comes into action.

To the Right.—No. 2 Battery in Advance.



Upon No. 2 battery opening fire, No. 1 battery limbers up, moves from I to I′, and comes into action. Upon No. 1 battery opening fire, No. 2 battery limbers up, moves from II to II′, and comes into action. Upon No. 2 battery opening fire, No. 1 battery limbers up, moves from I′ to I″, and comes into action. Upon No. 1 battery opening fire, No. 2 battery limbers up, moves from II′ to II″, and comes into action. Upon No. 2 battery opening fire, No. 1 battery limbers up, moves from I″ to I‴, and comes into action.

Right Back.—No. 1 *Battery in Advance.*



Upon No. 1 battery opening fire, No. 2 battery limbers up, moves from II to II′, and comes into action. Upon No. 2 battery opening fire, No. 1 battery limbers up, moves from I to I′, and comes into action. Upon No. 1 battery opening fire, No. 2 battery limbers up, moves from II′ to II″, and comes into action. Upon No. 2 battery opening fire, No. 1 battery limbers up, moves from I′ to I″, and comes into action. Upon No. 1 battery opening fire, No. 2 battery limbers up, moves from II″ to II‴, and comes into action.

1*st Case.*—In these movements, oI oI′ oI″, oII oII′ oII″, are supposed to represent distances equal to the distances between

the successive positions of the artillery when advancing or retiring in line.

It will be observed, when the change of front is the eighth of the circle, or an angle of 45°, that while the body composing the reverse flank of the division or brigade moves over the distance *a b c*, wheeling at the point *b*, the artillery passes over the same distance, and also a distance equal to the base of an isosceles triangle, of which the sides are formed by two lines, each equal to the distance between the consecutive positions of the artillery when advancing or retiring in line. The vertical angle of this triangle being equal to 45°, this distance is evidently equal to twice the sine of 22° 30′, to radius equal to either of the sides of the triangle. Twice the sine of 22° 30′, in terms of the radius, equals 765, 27′ 68, a little more than two-tenths less than the side of the triangle. Therefore, the distance passed over by the battery on the pivot flank may be taken in practice equal to the distance between the consecutive positions of the artillery when advancing or retiring in line; each battery, also, during the movement, limbers up, and comes into action.

Taking S to express the distance *a b c*, t' the time occupied in wheeling by the body composing the reverse flank, d the distance between the consecutive positions of the artillery when advancing or retiring in line, V′ the velocity of the brigade, V the velocity of the artillery, and t the time occupied by each battery in limbering up and coming into action, we have the following—

$$\frac{S}{V'}+t'=\frac{S}{V}+2t+\frac{d}{V}.$$

Taking $t'=\frac{d}{V}$, $$\frac{S}{V'}=\frac{S}{V}+2t.$$

To the Right or Right Back.

oI, oI′, oI″, and oII, oII′, oII″, are supposed to represent distances equal to the distances between the successive positions of the artillery when advancing or retiring in line.

In these cases, while the body composing the reverse flank moves over the distances *a b c d*, wheeling at the points *b* and *c*, the artillery passes over the same distance and also a distance equal to twice the base of an isosceles triangle, which as already stated, may be taken equal to twice the distance between the consecutive positions of the

artillery when advancing or retiring in line, each battery limbering up and coming into action twice. Therefore, in this case, the expression becomes—

$$\frac{2S}{V'}+t'=\frac{2S}{V}+4t+\frac{2d}{V}.$$

Taking $t'=\frac{2d}{V}$,

$$\frac{2S}{V'}=\frac{2S}{V}+4t,$$

$$\frac{S}{V'}=\frac{S}{V}+2t.$$

2nd Case.—Half Right, or Half Right Back.

While the reverse flank of the brigade moves over the distance $a\,b\,c$, wheeling at the point b, and subsequently over the distance c II′ or c I′, the artillery moves over the distances II II′ or I I′, each equal to $a\,b\,c$, also the distances I I′, I′ I″, or II II′, II′ II″, one battery limbering up and coming into action once and the other twice; we have, therefore,

$$\frac{S}{V'}+t'+\frac{d}{V'}=\frac{S}{V}+2t+\frac{2d}{V}+t.$$

Taking $t'=\frac{2d}{V}+t-\frac{d}{V}$,

$$\frac{S}{V'}=\frac{S}{V}+2t.$$

To the Right or Right Back.

While the reverse flank of the brigade moves over the distance $a\,b\,c\,d$, wheeling at the points b and c, and subsequently over the distance d II″ or d I″, the artillery moves over the distances II II′, II′ II″, I I′, I′ I″, I″ I‴, or the distances I I′, I′ I″, II II′, II′ II″, II″ II‴; we have, therefore,

$$\frac{2S}{V'}+t'+\frac{d}{V'}=\frac{2S}{V}+4t+\frac{3d}{V}+t.$$

Taking $t'=\frac{3d}{V}+t-\frac{d}{V'}$,

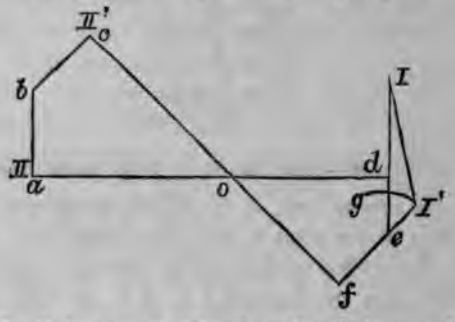
$$\frac{2S}{V'}=\frac{2S}{V}+4t,$$

$$\frac{S}{V'}=\frac{S}{V}+2t.$$

Changing Front upon a Central Point.

Here, also, two cases have to be considered—first, when the advanced battery is on the retiring flank; second, when the advanced battery is on the advancing flank.

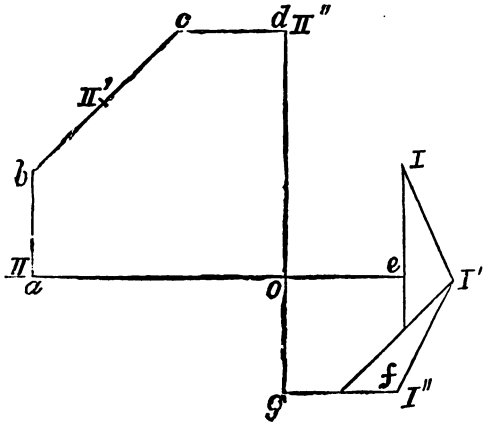
1st Case.—Change Front, Half Right.



Upon No. 1 battery opening fire, No. 2 battery limbers up, moves from II to II', and comes into action. Upon No. 2 battery opening fire, No. 1 battery limbers up, moves from I to I', and comes into action. After which the brigade will advance or retire as usual, No. 1 battery in advance.

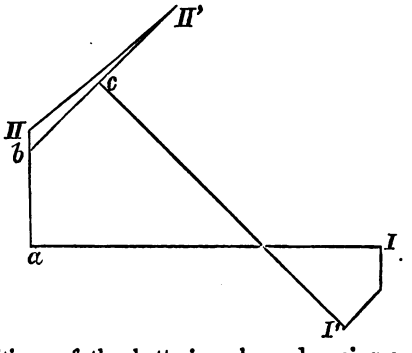
d I and *f* I' are supposed to represent distances equal to the distances between the successive positions of the artillery when advancing or retiring in line.

Change of Front, to the Right.



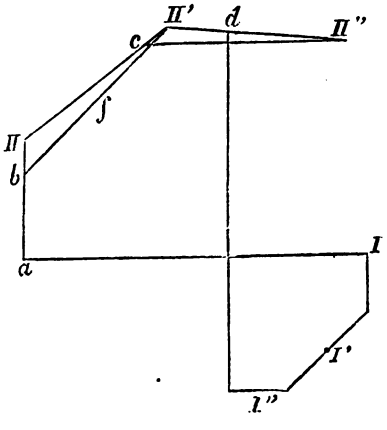
Upon No. 1 battery opening fire, No. 2 battery limbers up, moves from II to II′, and comes into action. Upon No. 2 battery opening fire, No. 1 battery limbers up, moves from I to I′, and comes into action. Upon No. 1 battery opening fire, No. 2 battery limbers up, moves from II′ to II″, and comes into action. Upon No. 2 battery opening fire, No. 1 battery limbers up, moves from I′ to I″, and comes into action. *e* I, *f* I′ and *g* I″ represent distances equal to the distance between the successive positions of the artillery when advancing or retiring in line.

2nd Case.—Change Front, Half Right.



Upon No. 2 battery opening fire, No. 1 battery limbers up, moves from I to I′, and comes into action. Upon No. 1 battery opening fire, No. 2 battery limbers up, moves from II to II′, and comes into action. *a* II *c* II′ are supposed to represent the distances between the successive positions of the batteries when advancing or retiring in line.

Change Front, to the Right.



Upon No. 2 battery opening fire, No. 1 battery limbers up, moves from I to I′, and comes into action. Upon No. 1 battery opening fire, No. 2 battery limbers up, moves from II to II′, and comes into action. Upon No. 2 battery opening fire, No. 1 battery limbers up, moves from I′ to I″, and comes into action. Upon No. 1 battery, opening fire, No. 2 battery limbers up, moves from II′ to II″, and comes into action. a II f II′ and d II″ are supposed to represent the distance between the successive positions of the artillery when advancing or retiring in line.

Case 1.—One of the distances, $a\,b\,c$ or $d\,e\,f$, must be equal to or greater than the other, and it will be evident that while one flank of the division or brigade is passing over a distance equal to or greater than half the distance passed over by the reverse flank, if the change had been made on a flank, the artillery will pass over the distances II II′, I I′, each battery limbering up and coming into action. Let S represent the same distance as in the former movements, and taking the distance passed over by the flank of the brigade at the minimum equal $\frac{S}{2}$, and also the distance I I′ passed over by the artillery on the retiring flank equal to I g, we have the following

$$\frac{S}{2V'}+t'=\frac{S}{V}+2t,$$

$$\frac{S}{V'}+t'=\frac{S}{V}+2t+\frac{S}{2V'}.$$

And taking $t'=\frac{S}{2V'}$,

$$\frac{S}{V'}=\frac{S}{V}+2t.$$

The arc g I′ being described with the centre e, and I d being equal to f I′, I g is equal to $f\,c+e\,d$.

It will be evident that with the same extent of front the distances $a\,b\,c$ and $d\,e\,f$ taken together, will be equal to the distance passed over by the reverse flank when the change is on a flank for $a\,b\,c=\cdot 8\ a\,o$ and $d\,e\,f=\cdot 8\ o\,d$. $\therefore a\,b\,c+d\,e\,f=\cdot 8\ a\,d$.

The same reasoning will hold good in the case of a change of front to the right, and we shall therefore have

$$\frac{2S}{V'}+t'=\frac{2S}{V}+4t+2\frac{S}{2V}.$$

Taking $t'=2\frac{S}{2V'}$,

$$\frac{2S}{V'}=\frac{2S}{V}+4t,$$

$$\frac{S}{V'}=\frac{S}{V}+2t.$$

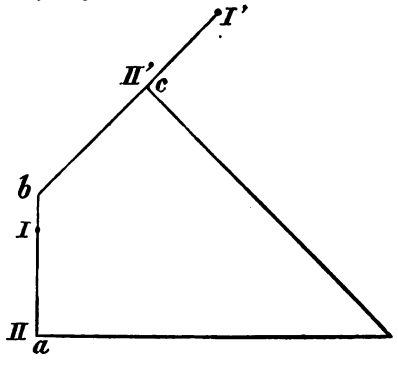
The same reasoning applied to the first two cases will hold good also in the two last, therefore in these cases also

$$\frac{S}{V'}=\frac{S}{V}+2t.$$

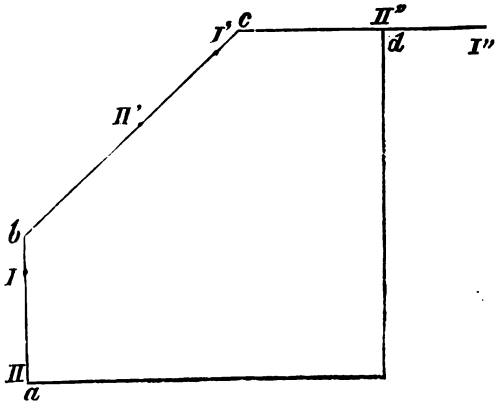
Change of Front, Artillery on the Reverse Flank.—No. 1 *Battery in Advance.*

Half Right.

No. 2 battery limbers up, moves from II to II′, and comes into action. Upon No. 2 battery opening fire, No. 1 battery limbers up, moves from I to I′, and comes into action.



To the Right.



Upon No. 1 battery opening fire, No. 2 battery limbers up, moves from II to II′, and comes into action. Upon No. 2 battery opening fire, No. 1 battery limbers up, moves from I to I′, and comes into action. Upon No. 1 battery opening fire, No. 2 battery limbers up, moves from II′ to II″, and comes into action. Upon No. 2 battery opening fire, No. 1 battery limbers up, moves from I′ to I″, and comes into action. II I, II′ I′, and II″ I″, represent distances equal to the distances between the successive positions of the artillery when advancing or retiring in line.

Half Right.

While the reverse flank of the brigade moves over the distance *a b c*, wheeling at the point *b*, the artillery passes twice over that distance, each battery limbering up and coming into action; therefore,

$$\frac{S}{V'}+t'=\frac{S}{V}+2t+\frac{S}{V}.$$

Taking $t'=\frac{S}{V}$,

$$\frac{S}{V'}=\frac{S}{V}+2t.$$

To the Right.

While the reverse flank of the brigade is passing over the distance *a b c d*, wheeling at the points *b* and *c*, the artillery passes twice over the same distance, each battery limbering up and coming into action twice, giving the same value to S as in the last case.

$$\frac{2S}{V'}+t'=\frac{2S}{V}+4t+\frac{2S}{V}.$$

Taking $t'=\frac{2S}{V}$,

$$\frac{S}{V'}=\frac{S}{V}+2t.$$

It will be seen that in all these cases, in which the artillery are working on both flanks or on the reverse flank, by assuming the equality of certain terms of the equations deduced in each case, we have reduced the whole to one formula

$$\frac{S}{V'}=\frac{S}{V}+2t.$$

We shall now see what margin we have left in each case, by assuming this equality.

1st Case.—Artillery on both Flanks, Half Right.

We have assumed $t' = \frac{d}{V}$, which in cavalry $= \frac{240}{8}$, in infantry $\frac{180}{6} = 30''$.

Right.

$$t' = \frac{2d}{V} = 1'.$$

Half Right.

2nd Case.—We have assumed $t' = \frac{2d}{V} + t - \frac{d}{V'}$, which in both cavalry and infantry $= o$, but a slight acceleration of pace on the part of the artillery in this case, or a slight reduction of the rate of the other troops, would allow sufficient time for the wheel.

Right.

$$t = \frac{3d}{V} + t - \frac{d}{V},$$

which in both cavalry and infantry equals 30″.

Artillery on the Reverse Flank.

We have assumed $t' = \frac{S}{V}$, which in cavalry, taking the front at 12 squadrons of 48 files, will equal half right 1′ 14″, and when the change is to the right 2′ 28″, and in infantry, taking the front at 6 battalions of 10 companies of 40 files, will equal half right 5′ 45″, and when the change is to the right 11′ 30″. When the change is made upon the centre artillery on both flanks we have assumed, when the change is half right, $t' = \frac{S}{2V'}$, which in cavalry $= 1' \times 42''$, and when the change is to the right 3′ 24″, and in infantry, half right 6′ 40″; and when the change is to the right 13′ 20″. This latter allows a wide margin for wheeling and formations, &c., and

therefore would be peculiarly applicable to the change made by the infantry in column formations on rough or accidented ground. If in the change on the centre the artillery should be working only on one flank, the movements will evidently depend upon the same principles as when the artillery are working on the reverse flank, but with a reduced extent of front. Taking the formula therefore $\frac{S}{V'} = \frac{S}{V} + 2t$, assuming the velocity of the artillery as constant, and also the extent of front of the cavalry and infantry, which we will suppose to equal the strength already stated for both arms, we can find the corresponding value of the velocity of the cavalry or infantry, as follows :—

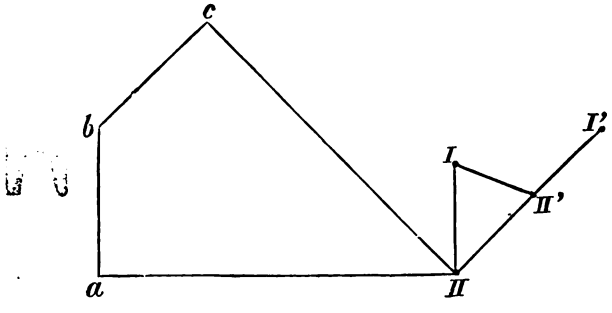
$$\frac{S}{V'} = \frac{S}{V} + 2t = \frac{V2t+S}{V}$$

$$\frac{SV}{V2t+S} = V',$$

$$S = \cdot 8x$$

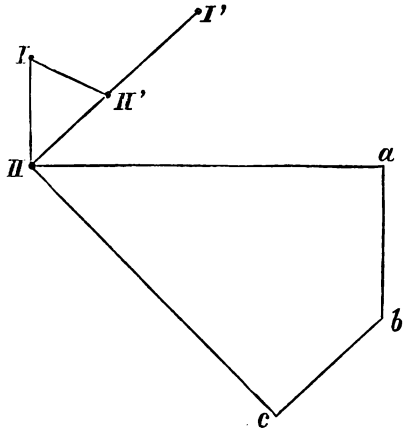
$$\frac{xV}{75V+x} = V'.$$

Change of Front, Artillery on the Pivot Flank, Half Right.



No. 1 battery in advance. Upon No. 1 opening fire, No. 2 battery limbers up, moves from II to II′, and comes into action. Upon No. 2 battery opening fire, No. 1 battery limbers up, moves round the rear of No. 2 battery to I′, and comes into action.

Half Right Back.



Upon No. 1 battery opening fire, No. 2 battery limbers up, moves from II to II′, and comes into action. Upon No. 2 battery opening fire, No. 1 battery limbers up, passes round the rear of No. 2 battery to I′, and comes into action. In both these cases, II I, II II′, II′ I′, each equal the distance between the positions of the artillery during the advance or retreat of the brigade.

It will be observed that while the reverse flank of the brigade moves along the lines *a b c*, and subsequently over the distance II II′, the artillery moves over the distances II II′, I II′, II′ I′, each battery limbering up and coming into action. Therefore

$$\frac{S}{V'}+t'+\frac{d}{V'}=\frac{2d}{V}+2t+\frac{d}{V}.$$

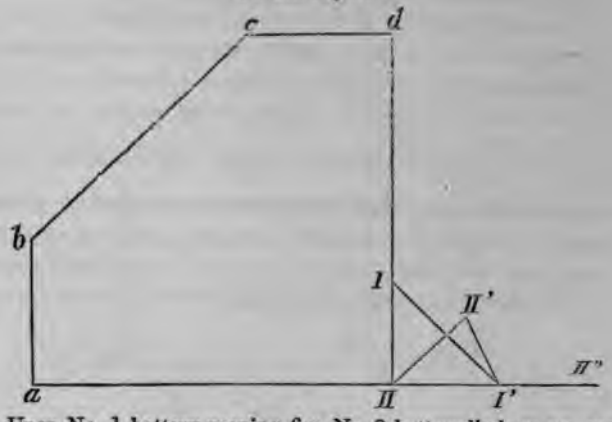
Taking $t'=\frac{d}{V}$,

$$\frac{S}{V'}=\frac{2d}{V}+t-\left(\frac{d}{V'}-t\right),$$

$$S=V'\left\{\frac{2d}{V}+t-\left(\frac{d}{V'}-t\right)\right\},$$

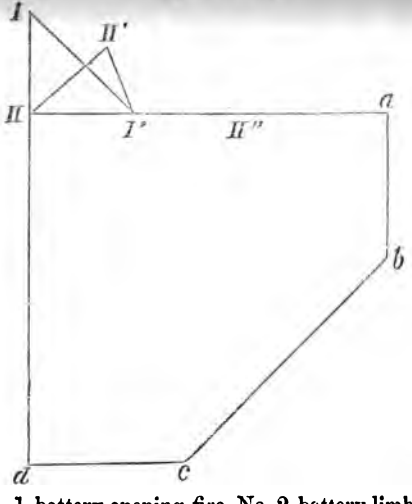
$$x=V'\frac{10}{8}\left\{\frac{2d}{V}+t-\left(\frac{d}{V'}-t\right)\right\}.$$

To the Right.



Upon No. 1 battery opening fire, No. 2 battery limbers up, moves from II to II′, and comes into action. Upon No. 2 battery opening fire, No. 1 battery limbers up, moves from I to I′, and comes into action. Upon No. 1 battery opening fire, No. 2 battery limbers up, moves round the rear of No. 1 battery to II″, and comes into action.

Right Back.



Upon No. 1 battery opening fire, No. 2 battery limbers up, moves from II to II′, and comes into action. Upon No. 2 battery opening

fire, No. 1 battery limbers up, moves from I to I′, and comes into action. Upon No 1 battery opening fire, No. 2 battery limbers up, moves round the rear of No. I′ battery to II″, and comes into action. In both these cases, II II′, II I′, I′ II″ equal the distance between the positions of the artillery during the advance or retreat of the brigade. While the reverse flank of the brigade moves along the lines *a b c d*, and subsequently over the distance II I′, the artillery moves over the distances II II′, I I′, II′ I′, and I′ II″; one battery limbering up and coming into action once and the other twice. Therefore

$$\frac{2S}{V'}+t'+\frac{d}{V'}=\frac{4d}{V}+2t+t+\frac{d}{V}.$$

Taking $t'=\frac{d}{V}$ as before,

$$\frac{2S}{V'}=\frac{4d}{V}+2t-\left(\frac{d}{V'}-t\right),$$

$$\frac{S}{V'}=\frac{2d}{V}+t-\tfrac{1}{2}\left(\frac{d}{V'}-t\right),$$

$$S=V'\left\{\frac{2d}{V}+t-\tfrac{1}{2}\left(\frac{d}{V'}-t\right)\right\},$$

$$x=V'\frac{10}{8}\left\{\frac{V2d}{V}+t-\tfrac{1}{2}\left(\frac{d}{V}-t\right)\right\}.$$

As this last value of x is greater than the former, and as x varies directly with V′, and inversely with V, it follows that the last value of x will fulfil the conditions in both cases. Therefore, taking, as in the former cases, the velocity of the artillery as constant as well as the extent of front, we can find the corresponding velocity of the other troops composing the division or brigade as follows:—

$$S=V'\left(\frac{2d}{V}+t-\frac{d}{2V'}+\frac{t}{2}\right),$$

$$=V'\left(\frac{2d}{V}+\frac{3t}{2}\right)-\frac{d}{2},$$

$$\frac{2S+d}{2}=V'\frac{4d+3Vt}{2V},$$

$$V\frac{2S+d}{4d+V180}=V',$$

$$\frac{2S+d}{\frac{4d}{V}+180}=V',$$

$$S=\cdot 8x,$$

$$\frac{1\cdot 6x+d}{\frac{4d}{V}+180}=V'$$

NOTE 20.

Quick Time.	Double.	Uniform Velocity.
$\frac{7}{8}$	$\frac{1}{8}$	1·5789
$\frac{3}{4}$	$\frac{1}{4}$	1·6666
$\frac{1}{2}$	$\frac{1}{2}$	1·87500
$\frac{1}{4}$	$\frac{3}{4}$	2·14290
$\frac{1}{8}$	$\frac{7}{8}$	2·30775

Walk.	Trot.	Uniform Velocity.
$\frac{7}{8}$	$\frac{1}{8}$	2·1354
$\frac{3}{4}$	$\frac{1}{4}$	2·2836
$\frac{1}{2}$	$\frac{1}{2}$	2·6666
$\frac{1}{4}$	$\frac{3}{4}$	3·1999
$\frac{1}{8}$	$\frac{7}{8}$	3·5555

Walk.	Gallop.	Uniform Velocity.
$\frac{7}{8}$	$\frac{1}{8}$	2·1818
$\frac{3}{4}$	$\frac{1}{4}$	2·4000
$\frac{1}{2}$	$\frac{1}{2}$	3·0000
$\frac{1}{4}$	$\frac{3}{4}$	4·0000
$\frac{1}{8}$	$\frac{7}{8}$	4·8000

Walk.	Gallop out.	Uniform Velocity.
$\frac{7}{8}$	$\frac{1}{8}$	2·2068
$\frac{3}{4}$	$\frac{1}{4}$	2·4614
$\frac{1}{2}$	$\frac{1}{2}$	3·2000
$\frac{1}{4}$	$\frac{3}{4}$	4·5714
$\frac{1}{8}$	$\frac{7}{8}$	5·8180

Trot.	Gallop.	Uniform Velocity.
$\frac{7}{8}$	$\frac{1}{8}$	4·1736
$\frac{3}{4}$	$\frac{1}{4}$	4·3636
$\frac{1}{2}$	$\frac{1}{2}$	4·8000
$\frac{1}{4}$	$\frac{3}{4}$	5·3333
$\frac{1}{8}$	$\frac{7}{8}$	5·6728

Trot.	Gallop out.	Uniform Velocity.
$\frac{7}{8}$	$\frac{1}{8}$	4·2708
$\frac{3}{4}$	$\frac{1}{4}$	4·5672
$\frac{1}{2}$	$\frac{1}{2}$	5·3333
$\frac{1}{4}$	$\frac{3}{4}$	6·3996
$\frac{1}{8}$	$\frac{7}{8}$	7·0008

Gallop.	Gallop out.	Uniform Velocity.
$\frac{7}{8}$	$\frac{1}{8}$	6·1932
$\frac{3}{4}$	$\frac{1}{4}$	6·3996
$\frac{1}{2}$	$\frac{1}{2}$	6·8568
$\frac{1}{4}$	$\frac{3}{4}$	7·3842
$\frac{1}{8}$	$\frac{7}{8}$	7·6800

NOTE 21.

According to the present system the front rank and rear rank men hold the same relative position in column as in line, with the exception of column of fours (eight men abreast), in which the front rank and rear rank are in line.

I should propose that the regimental column should consist, first, of the whole of the front rank in column, followed by the rear rank in column, both in column ranks according to the frontage of the column. By this means a certain amount of complication will be avoided, the length of the column will not be increased, and all the column movements will be simpler and more regular.

2nd.—Directing or Regulating Point in Column.

The leading and regulating point in field columns to be in the centre, as in line. By this means we gain a certain amount of uniformity, and consequently of simplicity in our arrangements; for the leading and regulating point will be the same, whether in column or in line. This is also the mode of leading in column adopted by other nations, even by those who lead by a flank in line.

The column being composed of rank entire, we can introduce troop and division leaders between the column ranks in field columns as low as divisions of eight.

3rd.—Change of Direction or Successive Wheels of the Ranks of the Column.

I shall, in the first place, allude very shortly to a movement still recognized in our Cavalry Regulations as a parade movement, although it seems to have been long ago exploded from the regulations of other countries.

The Change of Direction in Column by means of the Halted Pivot.

The principles of the halted pivot are stated in our Cavalry Regulations, page 97, paragraphs 5 and 6. We shall now see how the principles here laid down bear the test of examination, and how the details have been carried out. We are told that the wheeling flank should move about one-half faster than the rate at which the

body is marching. This is evidently founded upon the fact that the arc of the quarter circle may be practically taken as equal to once and a half the radius. The radius is here evidently represented by the column frontage, and in open column the column distance is equal to the column frontage. Therefore, it seems to have been considered that if we take V to equal the rate of manœuvre or velocity at which the column is marching, m V to represent the velocity at which it is necessary the wheeling flank should move, x the frontage of the column, that

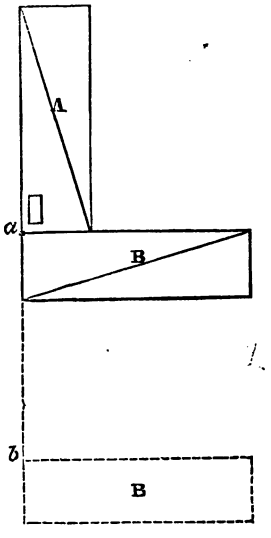
$$x : 1{\cdot}5x :: \mathrm{V} : m\mathrm{V}$$
$$x : 1{\cdot}5x :: 1 : m$$
$$1{\cdot}5 = m.$$

But it seems to have been forgotten that it is necessary to make an allowance when the change is to the pivot hand, for the depth of ranks added to the space occupied by the troop leaders, and when the change is to the reverse hand, for the depth of ranks representing this allowance by p, we have—

$$x-p : 1{\cdot}5\mathrm{x} :: 1 : m,$$

and the expression becomes—

$$1{\cdot}5\,\frac{x}{x-p} = m.,$$



as in column of troops. The allowance to be made in the first case equals 40 feet, and in the second 24 feet. This allowance entering as an element into the calculation will materially alter the value of the expression. Putting the expression in the form

$$1{\cdot}5\,\frac{x-p+p}{x-p} = 1{\cdot}5\left(1+\frac{p}{x-p}\right) = m,$$

it will be seen that m varies inversely with x and directly with p. That is as the extent of front is increased, the velocity on the wheeling flank is diminished, and as the allowance for the depth of ranks, &c., is increased, the velocity on the wheeling flank must be increased also.

Referring to the expression—

$$1{\cdot}5\,\frac{x}{x-p} = m$$

it is evident that when $x = p$ the movement is impossible. Therefore in the first case x must exceed 13 files, and in the last 8 files.

As an example of the velocity required on the wheeling flank, taking the strength of the squadron at 32 files, and consequently the frontage of the column of troops at 16 files, it will be found that in order that the leading troop of a squadron should clear the wheeling point before the succeeding troop arrives on to it, the wheeling flank must move at the rate of 90 miles an hour in the case first stated, and at 33 miles an hour in the last. This pace not being attained, what follows is a compensation, that is, a holding back at one time and a springing forward at another throughout the column, which destroys all smoothness and uniformity of movement.

In the case of the squadron column, taking z to represent the squadron interval, the expression becomes—

$$\frac{1{\cdot}5x}{x-p+z} = m$$

when $p = z$, which is the case when the squadron of four divisions equals 32 files, the expression becomes—

$$\frac{1{\cdot}5x}{x} = m$$

$$1{\cdot}5 = m.$$

This will be found applicable for all paces, and I should therefore suggest that if this mode of changing direction in column should be retained in our code of regulations, the march past in column, whether at the walk, trot, or gallop, should be made in column of squadrons.

I shall now dismiss this subject, the more particularly as it seems to be only admitted into our regulations as a parade movement.

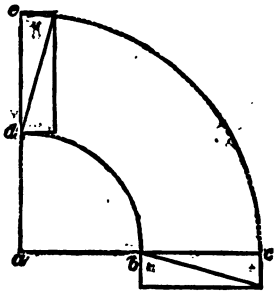
Moveable Pivot.

According to our present system, what is generally called the proper pivot flank in column is the regulating point during the change of direction. This point retains the pace of manœuvre during the change of direction, and so far the movement is good.

When the change of front is to the proper pivot hand, the inner flank on the hand wheeled to, is the regulating point. When the

change is to the reverse hand, the wheeling flank is the regulating point. In both cases the pivot leader is supposed, upon the word "right or left shoulders" being given, to circle round a central point, without altering his pace, until the word "forward" is given, when the wheeling body, or rank of the column, pursues the straight line.

We shall now consider—



1st. The change of direction to the proper pivot hand. Let R equal the distance of the regulating point from the central point. r equal $a\ b$ the distance between the centre point a and the inner flank b; x equal $b\ c$ the extent of front or frontage of the column. V the rate of manœuvre or velocity of the wheeling flank b, and m V the velocity of the wheeling flank c.

Also take $b\ d$ and $c\ e$ to represent the spaces passed over by the inner and outer flanks during the wheel. When the times are equal spaces are proportional to the velocities of moving bodies, therefore as similar arcs are proportional to their radii.

$$\mathrm{R} : \mathrm{R}+x :: \mathrm{V} : m\mathrm{V}$$
$$\mathrm{R} : \mathrm{R}+x :: 1 : m$$
$$\mathrm{R}m = \mathrm{R}+x$$
$$m = \frac{\mathrm{R}+x}{\mathrm{R}}$$
$$m = 1 + \frac{x}{\mathrm{R}}.$$

In this case $\mathrm{R}=r$, therefore—

$$m = 1 + \frac{x}{x}.$$

It will be evident that m varies directly with x, and inversely with r. As an example of the velocity necessary on the wheeling flank in this case, with reference to the space occupied in effecting the change of direction, we will suppose $a\ b$ to be equal to $b\ c$, when the expression becomes—

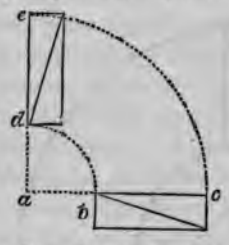
$$m = 1 + \frac{x}{x} = 2.$$

Therefore in this case the velocity on the wheeling flank would be double the rate of manœuvre.

Therefore if we suppose the column to be moving at the gallop

(11 miles an hour), the wheeling flank must move at the rate of 22 miles an hour, and the pivot leader must circle round a central point, at a distance from the inner flank, equal to the extent of frontage of the column.

If we reduce the distance from the regulating point to the centre point, we must increase the velocity on the wheeling flank and *vice versâ*.



For instance, if we make *a b* equal one-half *b c*, the expression becomes—

$$m=1+\frac{2x}{x}=3.$$

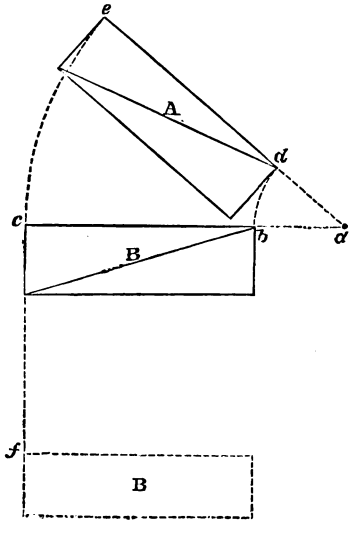
Therefore in this case the velocity on the wheeling flank would equal three times the rate of manœuvre. Therefore, if we suppose the column to be moving at the gallop, the wheeling flank must move at the rate of 33 miles an hour.

If we make the distance from the inner flank to the centre point equal to one-fourth of the frontage of the column, the expression becomes—

$$m=1+\frac{4x}{x}=5$$

$$m=5.$$

Therefore in this case it would be necessary that the wheeling flank should move at the rate of 55 miles an hour.



2nd. The change of front to the reverse hand. Take A and B to represent two adjacent ranks of a column, as B and the wheeling flank of A are both moving with the same velocity; it follows that when B has passed over the column distance *f c*, and arrived at the point *c*, where A commenced the wheel, the outer or wheeling flank of A will at the same moment have completed on the arc of the larger circle a distance *c e*, equal to *f c* the column distance. Therefore, we have to provide that, when B reaches the point *c*, where the

change should commence, the inner flank, or flank wheeled to, of A shall be out of the way, leaving B free to commence its movement in turn upon the arc of the circle.

Failing this there will be a stop or check, and all the evil consequences attending the wheel on a halted pivot will follow.

The problem to be solved is therefore as follows :—

What should be the length of the radius $a\ e$? or, in other words, at what distance from a central point a should the wheeling flank of A circle round, so that when it has completed on the larger arc a distance $c\ e$, equal to $f\ c$ the column distance, the inner flank or flank wheeled to of A, shall have completed on the inner or lesser arc a distance $b\ d$, equal to the depth of ranks ?

Let R as before equal $c\ a$ the distance of the regulating point from the central point, round which the pivot leader is supposed to circle.

Let x equal $c\ b$ the extent of front d, $b\ d$ the depth of ranks and y equal $f\ c$ or $c\ e$, the column distance r equal $b\ a$ the distance from the inner flank to the central point.

Then as similer arcs are as their radii—

$$\mathrm{R} : \mathrm{R}-x :: y : d$$

$$\mathrm{R}d=\mathrm{R}y-x\,y$$

$$x\,y=\mathrm{R}\,(y-d)$$

$$\frac{y}{y-d}x=\mathrm{R},$$

which may be put in the following form :—

$$\frac{y-d}{y-d}x+\frac{d}{y-d}x=\mathrm{R}$$

$$x+\frac{d}{y-d}x=\mathrm{R}.$$

In this case $\mathrm{R}=r+x$, therefore

$$\frac{d}{y-d}x=r.$$

It will be seen that r varies inversely with y and directly with x.

In open column the column distance equals the column frontage, therefore—

$$\frac{x^2}{x-d}=\mathrm{R},$$

and

$$\frac{d}{x-d}x=r.$$

According to the present system d equals eight yards, therefore it is evident that when x equals eight file (divisions of eight) the movement is impossible, as R becomes infinite.

The following table will give the values of R and r, corresponding to the values of x indicated in the tables:

x in files.	r in terms of the extent of front.	R in yards.
8	Inf.	Inf.
9	8	81
12	2	36
16	1	32
24	5	36

In column of fours, sections, half sections, and files, the distance becomes constant (12 feet or 4 yards), and may therefore be represented by D, and the expression becomes:

$$\frac{D}{D-d}x=R$$

$$=\frac{D-d}{D-d}x+\frac{d}{D-d}x$$

$$=x+\frac{d}{D-d}x \text{ but}$$

$$R-x=r \therefore$$

$$\frac{d}{D-d}x=r$$

d is also reduced from 8 yards to 8 feet.

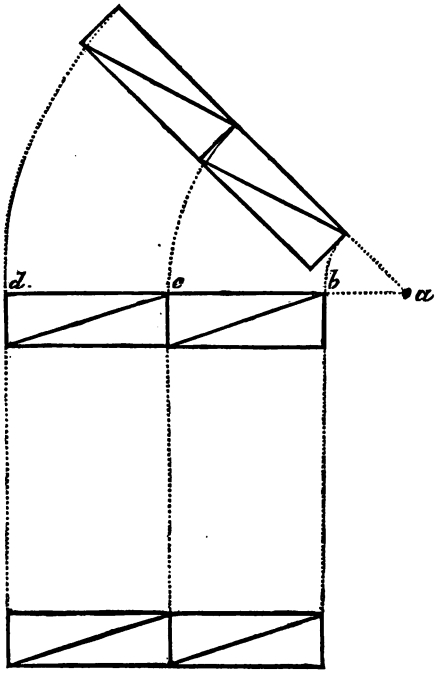
Therefore—

$$\frac{d}{D-d}=\frac{8}{12-8}=2.$$

$$2x=r. \therefore$$

In columns of route, the distance from the inner flank to the central point must equal twice the column distance; therefore, in column of fours, eight men abreast, the inner or pivot flank must move round an arc of a circle with a radius of 16 yards.

Advantages of Placing the Regulating Point in the centre of the Column Frontage, and of adopting the Rank Entire System, instead of that of Double Ranks.



It will be evident in this case, taking as usual R to represent the distance from the regulating point to the central point, round which each rank of the column revolves, and x to equal the column frontage, that both with reference to the half of the column frontage cd on the side of the central at regulating point towards the wheeling flank, and also with reference to the half of the column frontage $a\ b\ c$ on the side of the central or regulating point towards the inner or pivot flank, we may employ the formulæ already established in the first case with reference to the change of direction to the pivot hand; and in the second, with reference to the change to the reverse hand, when the regulating point is on the flank, as in our present cavalry regulations, only substituting $\frac{x}{2}$ for x, therefore in the first case—

$$m=1+\frac{x}{2R},$$

$$\text{but } R=r+\frac{x}{2} \text{ therefore}$$

$$2\ R=2r+x$$

$$m=1+\frac{x}{2r+x}.$$

In the second case

$$\frac{x}{2}+\frac{d}{y-d}\frac{x}{2}=\mathrm{R}$$

$$\text{but } =r+\frac{x}{2};$$

therefore—

$$\frac{d}{y-d}\frac{x}{2}=r$$

In open column $y=x$, and the expression becomes—

$$\frac{d}{x-d}\frac{x}{2}=r.$$

$$=\frac{d}{2(x-d)}x=r.$$

The column being formed in rank entire d equals 8 feet, and if we take x to equal 8 yards 24 feet (divisions of eight)

$$\frac{d}{2(x-d)}=\frac{8}{32}=\frac{1}{4}$$

Therefore

$$\frac{1}{4}x=r.$$

The expression $\frac{d}{2(x-d)}$ evidently varies inversely with x, therefore the value here found for r (the distance from the inner flank to the central point) will be sufficient for all columns of a greater frontage than divisions of eight, giving this value to r in the formula established in the first case

$$m=1+\frac{x}{2r+x}$$

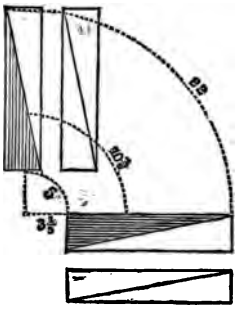
$$m=1+\frac{2x}{3x}=\frac{5}{3}.$$

Therefore, if the column were moving at the rate of the gallop according to present regulation (11 miles an hour), the rate on the wheeling flank would be only 18 miles an hour, and this will be constant for all columns, whatever may be the value of x. Therefore, by moving the regulating point from the flank to the centre, we have reduced the velocity on the wheeling flank to a moderate and practicable rate; and the distance from the inner flank to the central point, and consequently the space required to perform the wheel of

the ranks of the column, or change of direction, to one-fourth of the frontage of the column. To show that other nations appreciate the importance of moving the regulating point from the flank towards the centre, I will ask your attention for a few minutes to the mode of changing direction in column for a long time extant in the French service, merely premising that in the French service the column frontage is constant—divisions of 12, as recommended by Colonel Baker. The mode of performing the movement is as follows :—

The pivot describes an arc of 5 mètres; or, in other words, circles round a point at a distance of $3\frac{1}{2}$ mètres.

The point regulating the pace is supposed to move on an arc, at a distance from the central point round which the conversion is made, equal to half the radius of the outer or larger circle.



In practice the fifth file from the pivot is taken to represent this regulating point. This file is supposed to preserve the ordinary rate of march throughout the wheel, and the length of the arc over which this centre point is supposed to travel, is taken up at $10\frac{1}{2}$ mètres.

In the first place, it will be evident, from what has been already shown in speaking of our own moveable pivot to the pivot hand, that the regulating point for the pace being in the centre of the radius of the outer arc, the pace on the wheeling flank will be twice the ordinary rate of pace.

The rate for the gallop is 300 paces (300 mètres) per minute, which is equivalent to our 11 miles an hour; consequently the rate at the wheeling flank will not exceed 22 miles an hour.

According to our principle of wheeling just alluded to, in order to effect a change of direction under these circumstances, we should require a space equal to a segment of a circle, with a radius twice the length of the extent of front; but in consequence of the regulating point being moved from the flank towards the centre of the wheeling body, a proportionate amount of space is saved, and at the same time no faster rate is required on the outer arc.

With regard to the five files towards the pivot hand, the fifth file moves at the ordinary rate, while the others gradually decrease

the pace towards the pivot. It would at first appear that the movement of these five files should be governed by the rules belonging to our wheel on the moveable pivot to the reverse hand; but, in consequence of the column distance being equal to 12 mètres, while the length of the arc to be passed by the fifth file, moving at the ordinary rate, is only about $10\frac{1}{2}$ mètres, the leading peloton will have completed the quarter circle, and will have advanced a mètre and a half on the new line, upon the arrival of the succeeding peloton at the point where the wheel should commence.

This movement is, therefore, free from the difficulties arising from the interference of ranks, which encumber the change to the reverse hand in open column according to our principle.

NOTE 22.

I should propose that the columns should consist of—

Squadrons	32 Files.
Troops	16 „
Divisions	8 „
Fours	4 „
Files	2 „
Single Files	1 „

This is evidently a geometrical series or progression, of which the common ratio is 2.

I have put the squadrons at 32, as I think this is the smallest force which ought to be employed as an independent fighting body, which a squadron might be required to be on occasions; and because I do not think it likely that, according to present arrangements, we shall be able to bring our squadrons in the field up to a higher number. As we have adopted the movement by fours instead of threes, it is, of course, desirable that the divisions should divide by four. Therefore, if we can bring squadrons of greater strength into the field, the series would be—

Squadrons	48 Files.
Troops	24 „
Divisions	12 „
Fours	4 „
Files	2 „
Single Files	1 „

I have adopted the old denominations of files and single files, as in the first place, a file of men has been generally taken to indicate two men, a single file one man; and as in rank entire, fours are formed *bonâ fide* of four men abreast, there is no reason for changing the old denomination.

I shall not enter here into the discussion as to the comparative advantages of fours and threes. Like many other things, there is a good deal to be said on both sides; but as fours have been adopted in our service, and approved of, I don't think there is sufficient reason to advocate a change.

Working in rank entire, there are 16 feet from head to croup in column of divisions of eight. We can, therefore, introduce the troop and division leaders between the column ranks. According to the present system, there are only 12 feet from head to croup in column of divisions of 12.

In Colonel Baker's system, the rear rank is as formerly—at half a horse's length distance from the front rank. This gives a distance of 16 feet from head to croup in column; and as the division leader is at half a horse's length distance in front of his own division, there will be also half a horse's length distance between him and the rear rank of the division in front.

NOTE 23.

Commencing the Change of Front at an intermediate point between the positions of the Artillery when Advancing in Line.

So far it has been supposed that the change of front was commenced upon the brigade reaching one of the positions of the artillery, and all the movements have been calculated upon the supposition that the rear battery will have limbered up and be in movement, when the wheeling flank of the brigade shall have been in movement for 30″, counting from the moment that the change of front was commenced.

But if the change of front should be commenced at any intermediate point between the positions of the artillery, then it will be evident that the artillery should be at that point when the reverse flank of the brigade has reached a distance from such point corres-

ponding to the pace at which the change is being made, equal in time to 30″, which is as follows:—

Quick time	45 yards.
Walk	60 „
Trot	120 „

If the distance of the intermediate point from the position of the battery should be less than the above distances, the battery will not be limbered up upon the brigade reaching the intermediate point; but, as the battery has been in process of limbering up during the advance of the brigade to the intermediate point, the distance advanced by the reverse flank of the brigade from the intermediate point will be compensated for by the portion of the limbering up already effected, and in this case the battery will be at the intermediate point at the proper moment, moving at the same velocity as the reverse flank of the brigade. If the intermediate point should be at a greater distance from the position of the battery, the battery will be limbered up, as it will be only necessary for the officer commanding the battery to judge the distance, and order his pace, so as to arrive at the intermediate point in about 30″ or less, when the movement will proceed as already detailed.

It will be evident that this will be always possible, as the distance of the battery from the intermediate point cannot exceed the distance between the successive positions of the batteries when advancing or retiring in line.

NOTE 24.

The advantages of oblique echellon with reference to the formation from column to line are stated to be as follows in the Cavalry Regulations:—

1st. The preserving a general front during the march.

2nd. Retaining the power at any moment to stop the movement from the line and repel an attack.

As to preserving a general front during the march, the units forming the oblique echellon, all front to the direction in which they are moving, that is, upon lines at an angle of 45 degrees with the original line of covering of the column and the future line of formation. This would be so far good if they also preserved a fighting

order during the movement; but, on the contrary, the leading troop or division is the only portion of the echellon free to act offensively on the line of movement, the remainder overlap each other, and if they attempt to attack in that direction, they simply ride over each other and become a mass of inextricable confusion.

As to retaining the power at any moment to stop the movement from the line and repel an attack, the only line which can be formed must be parallel to the original line of covering of the column, and at right angles with the future line of formation; and this line can only be formed upon the supposition that the covering and distance of the echellons have been correctly preserved.

It would be reasonable to suppose, that the front formation was about to be made facing the expected point of attack; and it would hardly be reasonable to suppose, that without some extraordinary want of precaution on our part, the enemy should suddenly appear directly on our flank, and attack in a direction at right angles to the originally threatened line of attack.

It is possible, that during the formation, the enemy might attack with part of his force somewhere about the angle formed by the future line of formation, and a line at right angles to it.

But for all purposes of attack in this direction, we are for the time being, helpless, in consequence of the overlapping of the units of the echellon.

I conceive the objections to the oblique echellon formation to be the following:—

1st. Defective arrangements as to covering and distance.

2nd. Necessity of clearing the column in its whole length upon issuing from a road or ravine, or when passing round the flank of formed troops.

3rd. Necessity of an open right-angled triangular space free from obstacles, of which the two sides are the line of formation and the line of covering the column, and of which the hypothenuse represents the path traversed by the rear unit of the echellon during the formation, and this upon the supposition that the formation is made upon a halted base—if it is made on the move, an additional clear space will be required, represented by a parallelogram of which two of the sides are each equal to the extent of front—and of which the two remaining sides are dependent upon the combination of paces employed.

4th. Movement scattered and unprotected during the formation, particularly when the formation is effected on the move.

The preservation of the covering and distance is particularly difficult for cavalry when in this formation, especially at the fast paces.

If the covering is taken along the front or rear line of pivots, even at the walk, it is most difficult, and, at the faster paces, all but impossible, to keep it; for even a slight wavering in the line of pivots, the springing forward or hanging back of a single horse, a slight loss of covering in any one of the ranks of the echellon, shuts out the view of the line of covering, and, until the view of the general line is regained, there is no guide whatever for the echellons in rear of the point where the covering was lost.

This method of covering also involves the difficulty attendant upon moving in one direction and preserving the line of dressing in another, and requires that the post of the leader of each echellon, with reference to covering, be actually on the pivot flank of the echellon which he leads.

The position of the troop leader in our service, in front of the the second file from the directing hand, renders it impossible that he can preserve the covering upon this principle; hence arises a divided responsibility, the leader being answerable for the distance, and the guides for the covering.

This produces a complication, where all ought to be simple and plain; increases the number of links in the chain of responsibility, and consequently the number of sources of error.

In the present case we not only increase the number of responsible leaders by breaking up the squadron into two parts, but we add what may be called a twisted link between the leader and the troop or body which he leads; for the troop must move and dress by the guide. The guide is responsible for the distance from the troop leader, and the troop leader is responsible for the distance from the troop in front; besides which, the guide must judge the covering for himself, without any reference in that respect to the position of the leader.

It can scarcely be denied that this arrangement is bad; for surely the leader of a body of cavalry in the field, when in presence of the enemy, should be wholly and solely responsible for the leading of the body which he commands. All ranks should look

to him for guidance and direction, and divided responsibility should be avoided as much as possible.

It is not distinctly laid down in our regulations by what method the covering is to be preserved by the guides on the inner flanks of troops, and it is only by inference that we can come to the conclusion that the guides are responsible for the covering in oblique echellons as well as in column of troops.

If the principle of covering along the oblique line of the flanks of the echellons is not followed, the only remaining method is that of covering a particular file of the echellon in front.

In this case we are liable to the error produced by the opening out and closing of the ranks, as well as by the line of covering being broken instead of continuous. Altogether, the system appears too complicated to be depended upon for rough work and rapid movements, and if the covering and distance cannot be preserved at all paces and under all circumstances we lose the great advantage suppose to belong to the oblique echellon formation, namely, the power at any moment to stop the movement and wheel into line.

The formation from column to line is laid down in our Cavalry Regulations for the regimental column only. It may therefore be intended, that in brigade movements each regiment, upon coming on to the open ground, should form independently; and therefore it would be only necessary to extricate the rear of the first regimental column before commencing a formation to fighting order. But this would mend the matter very little, for another necessity in the system of oblique echellon formations is, that the whole line of covering of the column from front to rear must be placed at right angles with the future line of formation, or, at least, at an angle not differing very materially from a right angle, as otherwise the whole arrangement of the system dependent upon all the units of the echellon except the first moving upon parallel lines at an angle of 45° with the line of formation, will be lost. Therefore, before the commencement of the line formation in the last regimental unit in the column, the general base of formation must have advanced a distance equal to the entire length of the brigade column, or nearly so. This distance will be greatly increased if the formation is made on a moving base.

In all formations to line from column by means of the oblique echellon, the line of formation and the line of column form two

sides of a parallelogram, upon the diagonal of which the last unit of the echellon moves to a point opposite to its place in line.

The triangular space thus inclosed is, during the formation, covered by troops or divisions (according to the frontage of the column), all moving on parallel lines to their separate points of formation. If there should be any obstacle, natural or artificial, within this space, it must of necessity break the line of covering of the echellon. And it has been already shown that this line is most difficult to retain, and almost impossible to regain, in rapid movement.

In the French service the difficulty just mentioned is got over by breaking up the general column into squadron columns of divisions, which move upon diagonal lines to sixty paces in rear of their points of formation in line. Each column then wheels so as to place the front of the column parallel to the future alignment; and the squadron formation to line is completed by the oblique echellon movement within the sixty paces.

If the formation is effected upon a moving base, a clear space, without impediments, represented by a parallelogram of which one side equals the line of formation, and of which the other is dependent upon the combination of paces employed, is necessary for the reasons already specified. During the process of formation, all the units of the echellon remain scattered about the field—totally unprotected and uncovered by the portion of the force already in fighting order—and if the formation is made upon a moving base, this helpless state of transition is sensibly prolonged.

From the moment that the last unit of the oblique echellon turns from the oblique to perpendicular line of movement with reference to the proposed line of formation, the whole breadth of the line is exposed as a mark to the aim of the enemy's artillery, and this without the efficiency and advantage of a line formation.

If the formation be made on the move, the dangerous and transition position of all the unformed portion of the force will be more or less prolonged.

Formation from Column to Line.—I should propose that the formation to line from column should be made indifferently to the right hand or to the left, or, as Colonel Baker expresses it, "a column "should wheel to either flank, or form to the left or right of its "head."

I should propose that this inversion (as it is commonly called) or change of position of the units in line, or whatever it is proper to call it, should not extend lower than the column of fours.

That the increase of front from files or single files to fours should be effected on the move during the formation to line; that this is possible will be shown hereafter.

Supposing a regiment to consist of four squadrons of thirty-two files, each squadron of four divisions of eight, and two troops of sixteen, the effects of the arrangements just proposed would be the following:—

The flank squadrons respectively would sometime find themselves on the right flank of the regiment, and sometimes on the left. The centre squadrons would sometimes find themselves on the right of the centre of the regiment, and sometimes on the left.

The same would hold good with respect to divisions with reference to squadrons, and with respect to fours with reference to troops. As to the troops they would find themselves, one time on the right of the centre of the squadron, and another time on the left. Surely there is nothing in this to confuse the intellects of squadron, troop, or division leaders; it is not half so puzzling as acquiring and recollecting the rules relating to inverted movements in our Cavalry Regulations.

It seems now to be generally conceded, that as far down as columns of divisions there is no insuperable difficulty in the matter; but if we speak of what is called inversion by fours, we are met by a look of distrust and a feeling of intolerance of so great a change; but after all, where is the difficulty in this case more than in the others? The right flank man of fours remains the right flank man still: the left flank man the left flank man still; the right centre the right centre, and the left centre the left centre man still; and what possible difference can it make to any of these four individuals when they are ordered to wheel right or left, or about by fours, whether they happen at the time to be on the right, or on the left of their squadron, troop, or division? Surely we may trust the intelligence of our cavalry soldiers so far. We give them books, periodicals, comfortable rooms, easy chairs, writing paper, and in all respects treat them as intelligent beings, and I think we may give them credit for knowing in the field this small matter, particularly when we relieve their minds from other complications.

This last point gained, the great power we should acquire in

facility of formation from column of route on the move, must be evident, and when it is recollected that this is one of the great desiderata of the present day, this facility of forming on the move from columns of route rapidly and effectively, I think it will be admitted that it is worth sacrificing a certain amount of antiquated prejudice to attain it.

NOTE 25.

I shall now proceed to the proposed formation to line from columns of route. I have already spoken of the organization of these columns. I have endeavoured so far to follow the course which I stated to be the one I thought ought to be followed, by applying the system which has been found so successful in other matters, to the matter under consideration, namely, the close calculation of first principles within certain and defined limits, taking into consideration the variableness of the quantities to be dealt with, and also a close and minute attention to all the minor details. I have endeavoured to follow this course in treating of the organization of the column; I have investigated the principles of the wheel in column in all its bearings. I consider this movement essentially important, as the effective performance of it will enable the columns of route to pass smoothly and quickly through narrow passes and constantly varying ground. I shall now endeavour to pursue the same course with reference to the formation to fighting order in the open ground, under the protection of the artillery.

The principles of the formation are—

1st. That each unit of the formation, and consequently each rank of the column, should pass at once by a single wheel, made according to the principles of wheeling already specified, from column to direct echellon, and then to line.

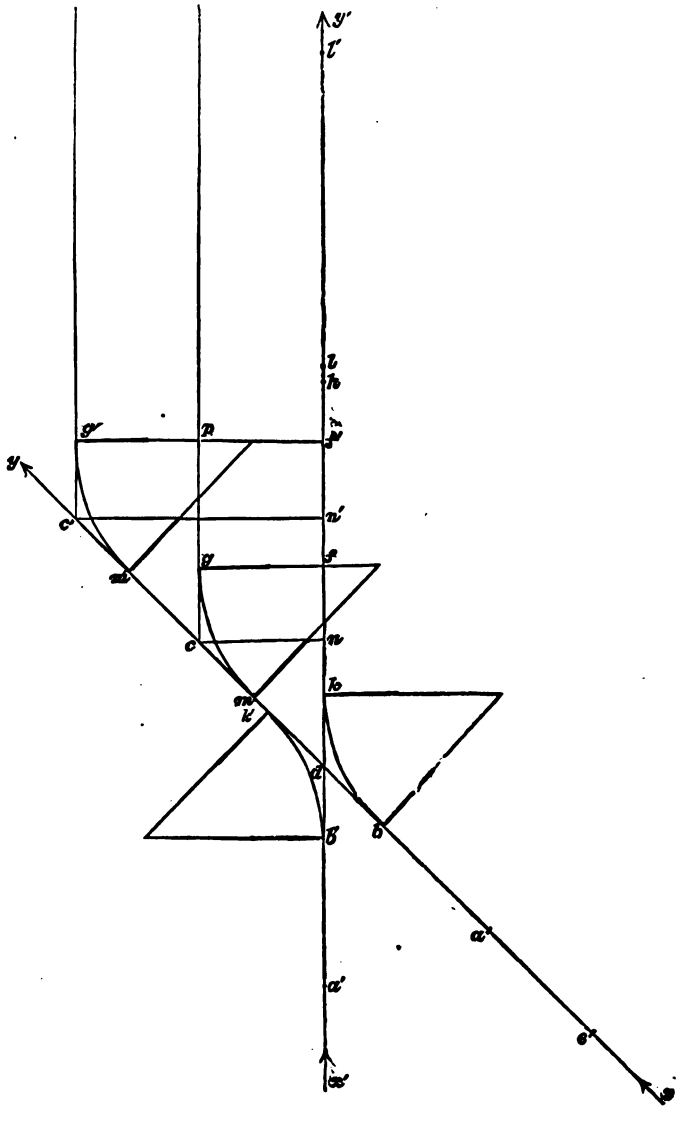
2ndly. That the portion of the force still in column should be protected from the view and action of the enemy, by the portion already formed in line, and consequently in fighting order.

3rdly. That the formation should be made indifferently to either hand, on a moving base.

The velocity of this moving base to be completely under the control of the Commandant of the cavalry force, as also the corresponding velocity of the remainder of the column, the slackening or accele-

ration of which, with reference to that of the moving base, evidently modifying the time and space required for the formation.

4thly. That the distance to be passed over during the advance by the base of formation from the moment that the line formation is



commenced to the moment that it is completed, shall depend upon the angle of inclination taken by the head of the column on issuing from the closed ground upon the open. This also will be completely under the control of the Commandant of the cavalry, and it must be plain how very important this latter would be, for there may be cases when, with reference to the position and movements of the enemy, a quick formation to a fighting order may be indispensable, while the base of formation passes over a comparatively short distance. On the other hand, there may be cases when it may be desirable to pass over a considerable distance at a rapid pace, exposing during the transit as small a front as possible to the enemy's artillery. It will be evident that in such a case a very rapid line formation would not be desirable; it would be only necessary that the formation to fighting order should be completed upon arriving within attacking distance, and not before. There may also be an intermediate case between the two already described, when a moderate rapidity in the line formation with reference to the distance advanced by the base of formation may be the most desirable. A reference to the calculation will show that all these cases have been provided for, and that by means of a very simple and practical arrangement the matter will remain altogether under the control of the Commandant of the cavalry, to act according to his own judgment, and as the circumstances of the occasion may dictate.

The calculation in this case is as follows:—

Passage from Columns of Route to Line; Proposed Alterations.

Let $x\,y$ be the original line of movement of the column.

b, m, m', &c., the points where the first, second, third, &c., ranks of the column turn in succession from $x\,y$ to parallel lines of movement, thus forming direct echellons.

R, the radius of the wheel at each of these points, = the distance from the centre of any rank of the column to the central point.

D, the distance in line between the parallel lines of movement of the column ranks when in echellon, $= g\,f$, $g'\,p$, &c.

D′, the distance in column between two successive ranks, $= e\,a$, $a\,b$, &c.

(D and D′ both being measured from corresponding points in the ranks.)

ω, an arc to radius unity of the angle wheeled, or the angle of inclination of the parallel lines of movement with the line of movement of the column, $\therefore$ $R\omega$ an arc of the same angle to radius R.

Now, suppose the leading rank to be at b, $\therefore$ the second rank at a, third rank at e, &c.; and all ranks to be moving at the same pace.

While the second rank, starting at a, moves the distance $a\,m\,g$, which brings it on to its new line of movement, the leading rank, starting at b, and moving at the same pace, passes over a distance $b\,k\,l = a\,m\,g$; and thus the first and second ranks are in direct echellon at the distance $f\,l$.

But $b\,d = \tan \frac{1}{2} R\omega = d\,k = m\,c = c\,g = m'\,c' = c'\,g'$, &c.

Hence $b\,m = d\,c$, $b\,m' = d\,c'$, &c. = &c.

$$\therefore\ a\,m\,g = a\,b + b\,m + \text{arc}\,m\,g,$$
$$= a\,b + d\,c + \text{arc}\,m\,g,$$
$$= D' + D \operatorname{cosec} \omega + R\omega.$$

$\therefore$ $b\,k\,l = a\,m\,g$, distance described by the leading rank during the passage of the first two ranks from column to direct echellons,

= distance described by second rank to form in echellon,

$$= D' + D \operatorname{cosec} \omega + R\omega \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (1).$$

Again, while the third rank, starting at e, moves the distance $e\,m'\,g'$, the first rank moves $b\,k\,l'$.

$\therefore$ $b\,k\,l'$ = distance described by the leading rank during the passage of three ranks into direct echellon from column,

$$= e\,m'\,g' = e\,b + d\,c' + \text{arc}\,m'\,g',$$
$$= 2\,a\,b + 2\,d\,c + \text{arc}\,m\,g',$$
$$= 2(D' + D \operatorname{cosec} \omega) + R\omega,$$

Similarly, for four ranks,

$$b\,k\,l'' = 3(D' + D \operatorname{cosec} \omega) + R\omega.$$

And for n ranks to be thrown into echellon, the distance to be described by the leading rank and the nth rank

$$= (n-1)(D' + D \operatorname{cosec} \omega) + R\omega \quad . \quad . \quad . \quad . \quad (2)$$

Now let $x'\,y'$, perpendicular to the future front in line or echellons, be the original line of movement of the column, instead of the diagonal line $x\,y$. The formation will be effected in this case by the

second and following ranks turning on to the diagonal line $x\,y$ at the point b', while the leading rank continues to advance along $x'\,y'$; and the second and following ranks will turn on to parallel lines of movement as before at m, m', &c.

Manifestly $a\,d$ and $a'\,d$ are equal, $\therefore$ the distance $a\,m\,g$, moved by the second rank when the column movement is along $x\,y = a'\,d + d\,m + \text{arc } m\,g$; but when the movement of the column is along $x'\,y'$, the second rank does not move this distance $a'\,d + d\,m + \text{arc } m\,g$, but moves a shorter distance; as instead of passing over $b'\,d + d\,k = 2 \tan \frac{1}{2} R\omega$, it describes the arc $b'\,k' = R\omega$; so that when the movement of the column is perpendicular to the future line, the distance to be moved by the second rank to form echellon is less than the distance described by the second rank when the column movement is on the diagonal line by $R(2 \tan \frac{1}{2}\omega - \omega)$; and is expressed by

$$D' + D \operatorname{cosec} \omega + R\omega - \{R(2 \tan \tfrac{1}{2}\omega - \omega)\} \quad . \quad . \quad . \quad (3)$$

And this holds good for all the succeeding ranks, until for the nth rank, we arrive at

$$(n-1)(D' + D \operatorname{cosec} \omega + R\omega) + R\omega - \{R(2 \tan \tfrac{1}{2}\omega - \omega)\} \quad . \quad (4)$$

Returning to the movement along the diagonal line $x\,y$, $b\,k\,f$ and $b\,k\,f'$ are the distances described by the leading rank from the point b to the points f and f', in line respectively with the points g and g', at which the succeeding ranks commence their parallel movement;

$$\text{and } d\,n = k\,f,\ d\,n' = k\,f',\ \&c. = \&c.$$

$$\begin{aligned} \therefore\ b\,k\,f &= k\,f + \text{arc } b\,k, \\ &= d\,n + \text{arc } b\,k, \\ &= D \cot \omega + R\omega \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (5) \end{aligned}$$

and $b\,k\,f'$ = the smallest distance to be moved by the leading rank to allow a third rank to form in echellon,

$$\begin{aligned} &= 2\,k\,f + \text{arc } b\,k, \\ &= 2\,D \cot \omega + R\omega. \end{aligned}$$

And so on, until the distance from b to the point in line with the point at which the nth rank commences its parallel movement, that is, the smallest distance to be moved by the leading rank to allow an nth rank to form in echellon,

$$= (n-1)(D \cot \omega) + R\omega \quad . \quad . \quad . \quad . \quad . \quad (6)$$

But when the column moves along the perpendicular line $x'y'$, the leading rank, instead of passing over the arc $b\,k = R\omega$, passes over a greater distance, viz., $b'd + d\,k = 2 \tan \frac{1}{2} R\omega$; so that when the movement of the column is perpendicular to the future line, the smallest distance to be moved by the leading rank, to allow a second rank to form in echellon, is greater than the distance to be described when the column movement is on the diagonal by $R(2 \tan \frac{1}{2}\omega - \omega)$; and is expressed by

$$D \cot \omega + R\omega + \{R(2 \tan \tfrac{1}{2}\omega - \omega)\} \quad . \quad . \quad . \quad . \quad (7)$$

and this holds good for all the succeeding ranks, until we arrive for the nth rank, when the above distance is expressed by

$$(n-1)(D \cot \omega) + R\omega + \{R(2 \tan \tfrac{1}{2}\omega - \omega)\} \quad . \quad . \quad (8)$$

Now, when the movement is from the diagonal line,

$$\begin{aligned} &\text{by } (1) b\,k\,l = D' + D \operatorname{cosec} \omega + R\omega \\ &\text{and by } (5) b\,k\,f = D \cot \omega + R\omega \\ \therefore\ & b\,k\,l - b\,k\,f = f\,l = \text{distance between the ranks in echellon,} \\ &= D' + D \operatorname{cosec} \omega + R\omega - (D \cot \omega + R\omega) \\ &= D' + D(\operatorname{cosec} \omega - \cot \omega). \quad . \quad . \quad . \quad . \quad (9) \end{aligned}$$

And the total distance between the first and nth ranks

$$= (n-1)\{D' + D(\operatorname{cosec} \omega - \cot \omega)\} \quad . \quad (10)$$

But when the movement is from the perpendicular line—

$$\begin{aligned} &\text{by } (3) b'\,k\,h = b\,k'\,m\,g \\ &\quad = D' + D \operatorname{cosec} \omega + R\omega - \{R(2 \tan \tfrac{1}{2}\omega - \omega)\} \\ &\text{and by } (7) b'\,k\,f = D \cot \omega + R\omega + R(2 \tan \tfrac{1}{2}\omega - \omega) \\ \therefore\ & b'\,k\,h - b'\,k\,f = f\,h = \text{distance between ranks in echellon} \\ &\quad = D' + D \operatorname{cosec} \omega + R\omega - \{R(2 \tan \tfrac{1}{2}\omega - \omega)\} \\ &\quad - \{D \cot \omega + R\omega + R(2 \tan \tfrac{1}{2}\omega - \omega)\} \\ &\quad = D' + D(\operatorname{cosec} \omega - \cot \omega) - 2R(2 \tan \tfrac{1}{2}\omega - \omega) \quad . \quad (11) \end{aligned}$$

so that the distance between any two ranks in the echellon, when the column movement is originally perpendicular to the future front in line, is less than the distance when the movement is diagonal, by $2\,R\,(2 \tan. \frac{1}{2}\,\omega - \omega)$; and this holds good for n ranks, when the distance between the first and nth ranks is expressed by

$$(n-1)\{D' + D(\operatorname{cosec} \omega - \omega)\} - 2R(2 \tan \tfrac{1}{2}\omega - \omega) \quad . \quad (12)$$

There are three methods of forming line from echellons or from column :—

I. By halting the leading rank of the echellons, the remainder continuing the original pace till each arrives in line, when it halts.

II. By reducing the pace of the leading rank, the remainder continuing the original pace till each arrives in line, when it takes up the reduced pace.

III. By increasing the pace of all the ranks except the first, which continues the original pace, each succeeding rank returning to the original rank when in line.

If the mode of formation indicated in I. is employed, the leading rank before halting must pass over the distance represented by (2) or (4) to clear the echellons, all ranks moving with the same velocity, but if the distance is counted from the moment that the wheel into the new direction is completed by the first or the second rank according as the column movement has been on the oblique or perpendicular line (2) and (4) become

$$(n-1)D' = D \operatorname{cosec} \omega.$$

Taking m equal $\frac{D'}{D}$ the expression becomes

$$(n-1)D(m + \operatorname{cosec} \omega)$$

which as nD is greater than $(n-1)$D we may take equal

$$nD(m + \operatorname{cosec} \omega)$$

but n D equals the extent of front in line, and if we take x to represent the variable extent of front the expression becomes

$$x(m + \operatorname{cosec} \omega).$$

Therefore $$m + \operatorname{cosec} \omega \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (13)$$

will express the distance advanced by the leading rank, while the remaining ranks are thrown into direct echellons in terms of the extent of front.

If II. or III. are employed, the distance passed over by the leading rank during the formation to line from echellons, subsequent to the reduction of the pace of the leading rank; if II. is employed or to the increase of the pace of all the ranks except the first, if III. is employed will, upon the supposition that V represents the velocity of the leading rank, and a V the velocity of the remaining ranks, be expressed by (10) or (12) divided by $(a-1)$. *See* note 10.

Counting the distance from the same point, as in the last case, both (10) and (12) become

$$(n-1)D'+D(\text{cosec}\,\omega-\cot\omega)$$
$$=(n-1)D(m+\text{cosec}\,\omega-\cot\omega)$$

which, taking as before nD for $(n-1)$D

$$=x(m+\text{cosec}\,\omega-\cot\omega)$$

therefore $$\frac{m+\text{cosec}\,\omega-\cot\omega}{a-1}$$

will express the distance advanced by the leading ranks during the formation to line from echellons on the move in terms of the extent of front.

The expressions (2) (4) (10) and (12) were arrived at upon the supposition that the leading rank and the remaining ranks of the column moved with the same velocity, but if we take V to represent the velocity of the leading rank, and a V some multiple of V to represent the velocity of the remaining ranks of the column, counting from the points already indicated (2) and (4) become

$$\frac{(n-1)D'+D\,\text{cosec}\,\omega}{a}$$
$$=x\frac{m+\text{cosec}\,\omega}{a}$$

therefore in this case $$\frac{m+\text{cosec}\,\omega}{a} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (15)$$

will express the distance advanced by the leading rank, while the remaining ranks are thrown into direct echellons in terms of the extent of front; (10) and (12) will in this case be expressed by

$$x\left\{\frac{m+\text{cosec}\,\omega}{a}-\cot\omega\right\}$$
$$=x\frac{m+\text{cosec}\,\omega-a\cot\omega}{a}$$
$$=x\left\{\frac{m+\text{cosec}\,\omega-\cot\omega}{a}-(a-1)\frac{\cot\omega}{a}\right\}$$

but $$x\frac{m+\text{cosec}\,\omega-\cot\omega}{a}$$

is greater than the above expression, and therefore may be taken to represent it.

Therefore in this case

$$\frac{m+\text{cosec}\,\omega-\cot\omega}{a(a-1)} \quad . \quad . \quad . \quad . \quad . \quad (16)$$

will express the distance advanced by the leading rank during the formation to line from echellons in terms of the extent of front, but to avoid a collision of ranks, which would take place if the ranks of the column should overtake the preceding ranks before the echellons were formed, the difference of the paces during the formation must not be too great—that is to say, a must be taken within certain limits; to ascertain the limiting value of a we must take

$$\frac{(n-1)\text{D}'+\text{D}\,\text{cosec}\,\omega}{a}(n-1)\text{D}\cot\omega=o$$

$$=\frac{m+\text{cosec}\,\omega}{a}-\cot\omega=o$$

Therefore $$\frac{m+\text{cosec}\,\omega}{\cot\omega}=a$$

which expresses the limiting value of a—that is to say, a must not exceed this value.

In column of fours rank entire $m=1$.

The values of cosec ω, and cosec $\omega-\cot\omega$, corresponding to the different angles, will be found in the following tables to one place of decimals.

Cosec ω.	
22° 30′	2·6
45°	1·4
67° 30′	1·

Cosec $\omega-\cot\varpi$.	
22° 30′	·2
45°	·4
67° 30′	·6

The values of a, corresponding to the different combinations of paces, are as follow:—

Walk..	Trot	2
	Gallop	3
	Gallop out..	4

Trot..	Gallop	1·5
	Gallop out .	2

Gallop..	Gallop out..	1·3

and the following table will give the limiting value of *a*, corresponding to the different angles:—

22° 30	1·5
45°	2·4
67° 30′	5·

Comparing this table with the former tables we find that when the angle of inclination is 22° 30′ we can employ the trot and the galop to effect the line formation.

When the angle of inclination equals 45° we can employ the same combination, and also the walk and the trot, the trot and the gallop out, as well as the walk and the gallop out; and when the angle of inclination equals 67° 30′, we can employ all the combinations of paces.

Under these circumstances, Table A will give the distance to be advanced by the leading rank, to throw all the ranks of the column into direct echellons; and Table B will give the distance to be advanced by the leading rank during the subsequent formation to line from echellons on the move, both in terms of the extent of front in line,—

A.

22° 30′	2·4
45°	1·2
67° 30′	·5

B.

22° 30′	1·6
45°	·6
67° 30′	·05

Increase of Front from Files or Single Files to Fours, previous to the Formation to Line.

In column of files taking the distance according to the present regulations, the distance is to the frontage as 2 to 1, and in column of single files 4 to 1, therefore in these cases *m* which represents the column distance divided by the column frontage, will equal 2 and 4 respectively, according as the column is composed of files or single files.

If the line formation be made on the move, according to the modes indicated in II. and III., it will be evident that the increase

of front must be made on the move also. This will involve a combination of the four paces, three and three, which gives four combinations, as follows,—

Walk..	Trot .. Trot .. Gallop..	Gallop Gallop out Gallop out

Trot..	Gallop..	Gallop out

As the necessity of reducing the frontage of the column indicates the passage through narrow roads or difficult ground, it will be best in this case to sacrifice rapidity to steadiness of movement; and, therefore, we will suppose that the column has not been moving at a faster pace than the trot, and that the subsequent formation to line shall be made by the leading rank breaking into the walk, while the remaining ranks maintain the trot, the increase of front being made at the gallop out. The second combination will, therefore, be found the most applicable. Taking therefore, this combination, and applying formulæ 15 and 16 to the formation of fours from files or single files, we find that when the combination is the walk, trot, and gallop out, the ranks of fours will be formed from files, while the leading rank of the column is passing over a distance equal to 2·9 of the extent of front, and from single files, while the leading rank is passing over a distance equal to 4·9 the extent of front. In this case the extent of front equals four yards; therefore, the above distances equal 11·6 and 19·6 yards respectively—say 12 and 20 yards. Therefore, if we suppose a squadron or any other body of cavalry to be moving at the trot in column of files, the increase of front to fours will be effected while the leading rank passes over a distance equal to 12 yards, upon the supposition that the movement is made at the gallop out, at an angle of 45°; and upon the same supposition, the increase of front will be made from a column of single files while the leading rank is passing over a distance equal to 20 yards.

The same will hold good if the increase of front of the ranks of

the column, instead of being simultaneous, should be successive; that is to say, if each rank of fours in rotation should commence the formation to fours at the same point at which the leading rank commenced; in which case it will be evident that the formation of all the ranks of fours throughout the column will be completed at the same point at which the formation of the leading rank was completed.

If, therefore, the formation to line should be commenced beyond this point, it will be evident that each rank of the column will come up to the point of formation, in turn, complete as a rank of fours; and, therefore, the formulæ 15 and 16 will be applicable, giving to m the values of 2 or 4, according as the column consists of files or single files.

It will, therefore, only be necessary, when the column is composed of files or single files moving at the trot, that the columns should continue the trot for the distance indicated according to the nature of the column beyond the point where the ground opens sufficiently to admit of an increase of front, after which the leading rank drops into the walk, and the formation to line from ranks of fours proceeds as usual; the only exception being that the distance between the ranks of the column are increased, and this must be allowed for, by giving a corresponding value to m in the formulæ.

NOTE 26.

Movements en Bataille, or Fighting Order in presence of the Enemy.

1. *Separation of the Ranks.*—According to the present regulation, the rear rank should be at a distance of one horse's length from the front rank, but we cannot expect this distance to be preserved in the hurry and excitement of action. The tendency of the rear rank horses, when excited, is to press up on or between the horses of the front ranks.

I think few will now contend that any additional impetus is given in the charge to the front rank by the actual pressure of the rear rank; in general, the tendency of a horse, when pressed upon by another is to hang back or kick. If the rear rank should be held

in hand as a support at some short distance from the front rank, a shot producing a casualty in the front rank may pass harmlessly over heads of the support; whereas, if the ranks are close together, the same shot may produce a casualty in both. In any case, if a front rank man and his horse go down, it is ten to one that his coverer goes over him.

With the arrangement proposed, the squadron, or any other body of cavalry, will form from column of route, and show a fighting front in one half the time they could do so if working according to the present system. The assault could then be delivered at once, and in the meantime a really effective support would be steadily formed in the rear. By this arrangement the front rank squadron can be equalised, and kept up to a certain strength—say 32 file; for as the rear rank is intended to act as an independent support, it is not absolutely necessary that each front rank man should have his coverer behind him, or that the front rank and supporting rear rank squadron should be of exactly the same strength; files may therefore be taken from the rear rank or support to fill up vacancies produced by casualties in the front rank, without interfering with the exactness of the future movements in line. Skirmishers may be sent to the front from the support, without altering the intervals or extent of front of the front rank squadrons. The rear rank squadrons may also be used for flank attacks, or to protect the flanks of the front rank line; and if the action of the artillery should be combined with the advance of the attacking line to the last moment previous to the assault, the rear rank, or support, or a certain portion of it, will be in the proper place to support the guns and their escort when the first line has passed forward to the charge.

Extract from a Letter from F. M. The Duke of Wellington, K.G.

"*Strathfieldsaye, 20th Nov.*, 1833.

"Cavalry is essentially an offensive arm, whose use depends upon its activity, combined with its steadiness and good order.

"I think that the second rank of cavalry at the usual distance of close order, does not increase the activity of the cavalry. The rear rank of the cavalry does not strengthen the front rank, as the centre and rear ranks do the front rank of the infantry. The rear rank of the cavalry can augment the activity, or even the means of attack of the front rank only by a movement of disorder.

"If the front rank should fail, and it should be necessary to retire, the second or rear rank is too close to be able to sustain the attack or to restore order. The second rank must be involved in the defeat and confusion, and the whole must depend upon some other body, whether of cavalry or infantry, to receive and protect the fugitives.

"I have already said that the rear rank can only augment the means of the first rank by a movement of disorder.

"This is peculiarly the case if the attack should be successful. In all these cases the second rank, at a distance sufficiently great to avoid being involved in the confusion of the attack of the front rank, whether successful or otherwise, could aid in the attack, or, if necessary, cover the retreat of the attacking party, and thus augment the steadiness and good order of the cavalry as a body; while, by the absence of all impediments from the closeness of the rear rank, the activity of the front rank would be increased.

"It cannot be denied that, till required for the actual attack, the less cavalry is exposed the better. My notion of the distance of the lines of cavalry was as much as a cavalry horse could gallop in a minute; the second line should pull up at a walk when the first charges; the third and other lines in columns should deploy, or be used according to circumstances.

"I conceive that the one-rank system would require a change, not only in the discipline, but in the organization of the cavalry. If I am not mistaken, it would render the use of cavalry in an Army much more general than it is at present.

(Signed) "WELLINGTON."

Extract from a Letter to General Bacon, from General Sir Hussey Vivian, G.C.B.

"As to the rank entire system, I am by no means certain that it would not always be a good thing, if on advancing to an attack, or standing in line, the rear ranks were to form a reserve at the distance, say of 80 or 100 yards; when so circumstanced they would be much better able to follow up an advantage gained by, or to repel a successful attack of, the enemy on the first rank. The fact is, that the second rank is but of little use but to fall over the first.

(Signed) "R. HUSSEY VIVIAN."

Extract from a Letter to General Bacon, from Lord William Russell.

"Anything that proves the efficiency of the single rank system is interesting to me; and it certainly was thoroughly proved on the 16th October, 1833, when your force of cavalry imposed on more than treble your numbers; this quite destroys the argument that a single rank 'look so weak,' and 'invites the enemy to charge.' Your adversaries were not to be tempted on the 16th. Keep notes of all the occurrences; we will one day put them in print.

"I am delighted to find that Vivian (Sir Hussey) looked with a more favourable eye on the system. Depend upon it they will all come round. He wants to get off on the *mezzo termine* of leaving the rear rank behind. This I entirely disapprove, because the rear rank so left would have no one to command it, and cavalry depends entirely on its officers.

"There is no doubt that, if cavalry is to act in one rank, a different organization is necessary. You must turn your mind to this, as the end of the war brings to your aid the practical reflections you can make now. The Duke of Wellington is in our favour, but the prejudices of the cavalry officers are difficult to be overcome.

(Signed) "WILLIAM RUSSELL."

NOTE 27.

The Correspondent of the *Standard*, in a Letter immediately after the fall of Magdala, writes as follows:—

"Thus terminated, soon after six o'clock, one of the most decided and bloody skirmishes which, perhaps, ever occurred. It will be, moreover, memorable as being the first encounter in which British troops ever used breech-loading rifles. Tremendous as was the fire, and great as was the slaughter, I am of opinion, and in this many of the military men agree with me, that the number of the enemy killed would have been at least as great had the troops been armed with the Enfield. The fire was a great deal too rapid. Men loaded and fired as if they were making a trial of rapidity of fire, and I saw several instances in which only two or three natives fell among a group, the whole of which would have been mown down had the men taken any aim whatever. At the end of an hour there was scarcely a cartridge left of the ninety rounds which each man carried into action, and the greater portion of them were fired away in the first quarter of an hour. The baggage guard used up all their stock, and were supplied with fresh ammunition from the reserve which they guarded. Against close bodies of men the breech-loader will do wonders. In the gorges where the natives were clustered thickly together it literally mowed them down. Upon the open not one shot in a hundred told. In a great battle the ammunition, at this rate of expenditure, would be finished in an hour."

ROYAL ENGINEER EQUIPMENT.

The Royal Engineer equipment at present consists of:—

1 Pontoon Troop.

1 Field Equipment Troop.

A portion of a unit of Field Telegraph Equipment.

The Pontoon Troop consists of 100 yards of Blanshard's heavy pontoon bridge, which will carry field artillery, cavalry or infantry, and 20-pounder Armstrong guns if shortened to 80 yards, by putting the pontoons closer together.

100 yards of bridge take about 40 minutes to make.

The waggons, when loaded, weigh 46 cwt. each; are without springs, and require a large space to turn in. They are drawn by 6 horses each, and would be able to keep up with infantry in average country. None of the pontoniers are carried.

A new equipment is in progress which will carry, in its ordinary state, 40-pounder Armstrongs; and, by adding timbers to the roadway, will carry 64-pounder siege guns and 13-inch mortars.

At the same time each waggon, when loaded, will not exceed 32 cwt., and all the pontoniers will be carried, thus enabling the equipment to keep up with any arm of the service.

These results have been attained without materially increasing the number of horses required for 100 yards of bridge.

It is expected that 100 yards of this new bridge will be put together in a somewhat shorter time than the same

length of the old one. The waggons are constructed so that the different parts may be interchangeable; are mounted on springs, and turn on their own ground.

The number of men, horses and waggons, in the present and in the new equipment, are as follows:—

Engineer officers . .		4	The same for both old and new equipment.
Non-commissioned officers, sappers and drivers		250	
Horses	old . . .	165	
	new . . .	180	(probably).
Waggons	old . . .	20	
	new . .	25	(probably).

These numbers are for a war establishment.

Field Equipment Troop.

The Field Equipment Troop consists of a field park and 3 sections conveying tools and equipment for 3 companies of sappers.

Nothing has been done towards remodelling the wagons, and other vehicles of this portion of the Royal Engineer equipment on the same principles as those adopted in the pontoon and telegraph trains, although perhaps this is the most important of all. Either a pontoon bridge or a line of telegraph could be improvised, if only sappers and tools were available.

The vehicles at present in use in this troop are of the general service army patterns, and no further description is required to show their inefficiency.

A proportion of pack saddles accompanies this troop, but they also are of the army pattern, and as useless as possible.

Proposals have been submitted to the authorities for remodelling the equipment of this troop; but nothing is to be done for the present.

Engineer officers	5
Non-commissioned officers, sappers and drivers .	250
Horses	180

Field Telegraph Equipment.

Unit of Equipment.—The unit of field telegraph equipment, which has been proposed for the service, consists of 6 travelling offices, and 36 miles of wire, and would require—

4 Engineer officers.
200 Non-commissioned officers, sappers, and drivers.
110 Horses.

Travelling Office.—The travelling office is a covered waggon, weighing 20 cwt., and drawn by a pair of horses. It is fitted up with 2 Morse recording instruments, with batteries, besides writing desk, &c., &c.

It also carries 2 spare instruments, with batteries, "sounding instruments," signal stores sufficient for 2 stations by day or night, tools, and camp equipments.

Mode of Carrying and Working the Wire.—The 36 miles of wire are carried on 12 "wire waggons," or in the proportion of 3 miles to each waggon.

The wire is insulated, and is wound on drums in half-mile lengths, from which it is paid out when required as the waggon moves along, at the rate of about 4 miles an hour in average country.

In dismantling a line, the wire is wound up by means of a self-acting arrangement in connection with the waggon wheels, at the rate of from 3 to 4 miles an hour.

In addition to the wire, each wire waggon carries the following stores:—

18 poles,
1 ladder,
1 wheelbarrow,

besides a complete set of tools and implements required in constructing and dismantling a line, and also a proportion of camp equipment.

Poles.—The poles are telescopic, made of iron tubing, and give a headway of about 16 ft.

They are used when it is necessary to carry the line over a road or track, where, if laid on the ground, it might be damaged.

Ladder.—The ladder is used in putting the wire up on trees, walls or houses, when they are available, and it is necessary to raise the line from the ground.

Wheel-barrow.—The wheel-barrow is used in paying out or reeling up the line in rough ground inaccessible to a waggon.

Besides the regular telegraph waggons, a proportion of general service wagons would be required with a telegraph equipment in the field, and would carry spare stores, both telegraph and signal, a field forge, artificers' tools, camp equipment, &c., &c.

The number of these would, of course, vary with the country and nature of the service.

Construction of the waggons.—The waggons are constructed with the same wheels, axles, &c., &c., as those used in the pontoon equipment.

They are mounted on springs and will turn on their own ground.

Weights of Waggons.—Their weights when loaded have not yet been finally determined, but the following are approximately correct, and will not be exceeded:—

Office waggons	20 cwt.
Wire waggons	30 ,,
Gen. service	30 to 36 cwt.

It is considered that waggons of these weights would be able to keep up and work with any arm of the service.

CAVALRY EQUIPMENT.

One of the chief points of discussion relative to the equipment of the cavalry soldier is the following:—

How should the carbine or firearm be carried by a mounted man? Different modes of carrying the carbine have been adopted at different times and in different services.

I. The mode so long extant in our cavalry service, of carrying the carbine with the muzzle inserted into a small holster, called a carbine bucket. The grip secured to the fore part of the saddle by a strap, called the carbine stay-strap, formerly with an arrangement for swivelling it to the pouch belt, when detached from the bucket and stay-strap.

II. A mode now adopted in some regiments of carrying the carbine in a leather case, attached to the saddle on the off side, behind the right leg.

III. The method proposed by the late Captain Nolan. Run under the off wallet through a holster, and fastened to the peak by a strap, which serves as a sling when the man is dismounted.

IV. Slung across the back by a strap, which passes over the left shoulder and under the right arm. This mode of carrying the firearm is adopted by the French light cavalry regiments on service, and by many irregular corps of different services.

V. With the butt of the firearm inserted into a kind of bucket or holster, and the barrel secured to the saddle by a stay-strap, as indicated in the Equipment Plates I. and II.

VI. Attached by a swivel to the pouch-belt, as shown in Plate IV.

VII. Attached by a hook and stay-strap to the waist-belt, with the muzzle down. The carbine is thus carried by several Indian irregular regiments.

There are other modes of carrying the carbine, or cavalry firearm; but they are not recognised in any disciplined service—for instance, with the sling over the right shoulder, secured from slipping off by a cord or strap, or else across the pommel of the saddle. I shall now consider these different methods in turn.

I. This mode of carrying the carbine has the following disadvantage: in the event of the man being separated from his horse by any casualty, the carbine remains with the horse, and the soldier is left without his firearm. It will be in the recollection of many how often this occurred during the Crimean war, Indian mutinies, and at other times.

II. This mode of carrying the carbine does not obviate the disadvantage attending the fact of the firearm being attached to the saddle instead of to the rider, and the carbine, together with the valise containing the kit, as well as the shoes in the cases, the corn bag, mess tin, and in India, the head and heel ropes, as well as the picketting pegs, are all attached to the hinder part of the saddle, and that without any counter-balancing weight in front, except that of the cloak, and whatever may be contained in the wallets; also by this attachment of the carbine, a weight of about eight pounds is imposed upon one side of the saddle without a counter-balancing weight on the other. This I consider a disadvantage, as giving a lateral draw to the saddle on the horse's back. I think the saddle ought to be balanced, not only fore and aft, but also laterally. We cannot place the kit on the fore part of the saddle.

For obvious reasons, it must be more or less behind; but if it can be avoided, I should not add to it the weight of the carbine, and that on one side, for I think few things tend more to give a horse a sore back than the uneven balance of the saddle.

III. This appears to me to be a simple, well-contrived, and convenient way of carrying the carbine. When attached to the saddle "under the off wallet, the carbine "is run through a holster; it can thus be got rid of and "returned in an instant. It is fastened to the peak by a "strap about a yard long, which serves as a sling for the "carbine when dismounted." But it does not get rid of the disadvantage already mentioned—that in the event of a sudden casualty separating the man from his horse, the firearm remains with the horse and not with the man. A horse may be struck with a rifle-ball—and this will now be more likely to happen than heretofore; the wound may not be mortal or even serious, but the shock of even a slight wound may cause the horse to stumble and go down —or he may put his foot in a hole, or stumble on rough ground, and be unable to recover himself. The next thing that happens is that horse and rider roll on the ground together; the rider is stunned and confused for the moment, and in the meantime the horse struggles up and gallops off with the firearm attached to the saddle. But besides this disadvantage, which attends all attachments to the saddle during action, the carbine is fastened to the peak of the saddle by a strap about a yard long, and in order to avail himself of his firearm the man must unbuckle and detach this stay-strap, and in order to avail himself of his other arm, the sword, he must insert it in the holster and strap it up again. It is true that if the horse is standing still these movements occupy but a second or two, but even a second or two upon very critical

occasions are all important, and when the horse is at speed the strapping and unstrapping is not so easy, and at least takes a longer time than when he is standing still. A cavalry man ought to be able to pass in a second from one arm to the other while his horse is at speed, and that without any strapping or unstrapping.

IV. By this method the firearm is certainly attached to the man, and not to the horse; but it appears to me that the following disadvantages belong to it:—If the men have to cloak, the carbine must be unslung, and slung again over the cloak. In order to this, the coat must be made with sleeves, so as to leave the right arm free, and the sling altered, for the length that will fit over the cloak will be rather loose without it. In wet weather, if stoppers are not used, the rain will penetrate down the barrel. There must be always more or less difficulty and awkwardness in getting the sling over the head, which will be greater or less according to the head-dress worn by the soldier. The pressure caused by the weight of the carbine upon the muscles of the shoulder becomes painful when long continued. The difficulty of unslinging the carbine is increased when the horse is in motion. A dropping cut of a sharp sword upon the portion of the sling behind the left shoulder would sever it, and the arm then drops to the ground. It certainly has the following advantages:—If man and horse are separated, the firearm remains with the man; there is no difficulty in mounting or dismounting with the carbine slung in this way; and in this position the carbine may protect the back from a sword-cut.

V. To this method belongs the disadvantage of the firearm being attached to the horse, and not to the man; but it seems to be used in time of peace for exercise and field days, to relieve the men from the weight of their

firearm, which on service would be carried across the back. For service purposes, it did not appear to me to be well adapted; but its being thus carried, I think, tends to show that, slung across the back, even if adapted for service, is not the most comfortable way of carrying the firearm.

VI. By this method the firearm is certainly attached to the man, and not to the horse; but it more or less annoys and irritates the horse when in movement, and this inconvenience is greatly increased if the carbine is long and heavy. It impedes the man in taking aim, and renders the action of bringing the carbine up to the present difficult and embarrassing. It is awkward in mounting and dismounting. This method of carrying the carbine seems to be exploded in most services, as well as our own, and we can hardly be said ever to have swivelled our carbines with the intention of letting them hang by the pouch-belt.

VII. In this case, the firearm is attached to the man instead of to the saddle, and the weight, instead of being imposed upon the left shoulder, as is the case when slung across the back, or swivelled to the pouch belt, is borne upon the waist and over the hips, and anyone who will examine the bone structure of the human frame will, I think, come to the conclusion that in the case of a mounted man, the weight is better placed in the latter position than in the former. In the first case, the weight is thrown upon a muscle, a most important agent in the action of the arm, and upon which a long continued pressure produces pain. Anyone who has carried a pouch filled with ammunition for a considerable time, will have realized this fact, and we must recollect that in imposing the weight of the carbine upon the left shoulder, we add it to the weight of the ammunition.

I have marched long marches with cavalry carrying the

carbine attached to the waist belt, and the men did not complain of the inconvenience.

Admitting that it is most desirable that the firearm should be attached to the rider and not to the saddle, it has always appeared to me that the way to carry it is attached to the waist belt. But there are the following disadvantages belonging to the present mode of carrying the carbine thus attached. There is an awkwardness in mounting with the carbine, and although with short carbines the men manage to mount quickly, the awkwardness would increase with the length of the carbine. The carbine is supported by the ring upon a hook in the waist belt; but this hook being straight up and down, the action of the horse would jerk the carbine off the hook, and it therefore becomes necessary to secure the carbine to the hook by a stay-strap. The man, therefore, before he can bring his carbine into action, must unbuckle or unbutton the stay-strap. This is very quickly done by an expert well-trained man when the horse he is riding is stationary; but still it takes a second or two, and while detaching his carbine, the man must look down and give his attention to it for the moment, and when the horse is in action, the difficulty is greater and the time required longer. The whole weight of the carbine is supported constantly on the waist and hip, and this is in addition to the weight of the sword on the near side.

Having come to the conclusion that the firearm should be attached to the man, and not to the saddle in action, and that being attached to the waist-belt seems to present less disadvantages than any other mode of carrying it, I turned my attention to obviating as much as possible the disadvantages just mentioned. A cavalry man ought to be able to mount and dismount quickly, with his arms attached, without awkwardness or difficulty. He ought to be able to get at his firearm, and bring it into action,

as quickly, if not more quickly, than his sword. The waist and hip should be relieved as much as possible of the weight of the carbine, even in action. That is, when the men are formed *en battaile;* and when marching at ease, there should be a mode of attaching it centrally (not at one side) to the forepart of the saddle; but so that in a second, when the order to form is given, the carbine should be re-attached to the waist-belt.

In order to meet these requirements, I should propose the following modifications in the usual mode of attaching the carbine to the waist-belt.

That the carbine should be supported by a steel loop or bar on the stock, by means of which it can be attached to a hook placed at a certain angle on a double steel-plate, through which the waist-belts of the present pattern can be passed. The jerking motion produced by the action of the horse in trotting, galloping, or leaping, is more or less on a line vertical to the surface of the ground, and, although this movement would jerk the carbine off a hook placed in the usual manner straight up and down on the waist-belt, unless retained by a stay-strap, when the hook is placed at an angle upon the plate greater than the angle formed with the horizontal line by any line of motion upon which the action of the horse could cause the bar of the carbine to work, the carbine will remain attached to the hook under all circumstances without a stay-strap. I have tested this in every possible way, and it must be obvious that the movement of the horse only drives the bar against the hook, without detaching it. So far nothing more has been done than altering the angle of the hook and attaching it to a double steel-plate, through which the belt is run, and, having no stay-strap to unbuckle or unbutton, it will be evident that the action of attaching and detaching the carbine will be instantaneous, and being attached

to the hook by a fixed bar instead of a sliding ring, it can be attached or detached by a feeling of the hand without the necessity of looking down.

In order to relieve the waist and hips as much as possible from the weight of the carbine, and also to enable a man to mount and dismount without difficulty with his firearms, a small circular spring is attached just above the knee of the right leg into which the barrel of the carbine can be inserted by a single, quick motion of the right hand before mounting (*see* Plate IX.), detached when mounted in a moment from both hook and spring, in order to bring the carbine into action, and attached again as rapidly, and this can be done with ease when the horse is at speed. If the men wear overalls, it would be necessary to attach the spring by a small strap (*see* Plate VI.) or by some other means which might be devised. But if boots should be substituted for overalls, and the boots should be made to form a defence to the leg by having them made with a small, thin bar of steel running the length of the leg of the boot, the bar could be attached inside the leather without in anyway altering the appearance of the boot, and in this case the small spring could be fastened to the top of the bar of the right boot, which would bring it exactly into its right place when the man is mounted (*see* Plate X.).

The spring could be easily fastened to the bar, and unfastened again by a single screw; but the spring is so small it would not attract attention when the man was dismounted, even if left attached to the boot.

The relative advantages of boots and booted overalls have been often discussed, and the discussion seems to have ended in favour of overalls, for they are retained in our equipment; but nearly every one I have spoken to on the subject seems to prefer boots. Nearly all the irregular cavalry I have seen wear boots, and I think it will be

generally admitted, that during the Crimean war and Indian mutinies, every mounted man that could do so wore boots. We don't, as a general rule, wear overalls hunting or when we equip ourselves for a long ride in wet weather and muddy roads. I think most people will allow boots are better than overalls, and the dust and sand from which men on the march in India suffer so much in the dry weather will get under the overalls and produce discomfort. Boots are easier to clean than overalls after a wet or dusty march; but there is evidently something about overalls which renders them desirable; for they are still retained in our equipment. As to expense, taking into consideration the time which a pair of long boots would last, I think it will be allowed that they would be the cheapest if substituted for the present boots, as the breeches or trousers to be worn with them would cost less than the strapped and booted overall. As to the appearance, that of course is a matter of opinion.

By placing the barrel in the spring as described, a certain portion of the weight, when the man is mounted, is borne by the stirrup, which consequently relieves the waist, and the carbine is also further secured from any possibility of becoming detached by the motion of the horse, and is also in a position which enables the man to attach and detach it in a moment. In the case of the horse falling flat on his side, which is not a very likely casualty to occur, the barrel being forward on the knee, would fall clear of the man's leg, and the stock is in the hollow between the hip and the ribs. When carried in the carbine bucket in the event of a similar accident, there would be a probability of the man's thigh-bone being broken, and it would be impossible to equip a man so as to provide altogether against his being injured in case of accidents.

The spring is perfectly simple and strong in construc-

tion; not in the least likely to break or get out of order, even if the spring, which is contained within the ring, should break or fail, which is almost impossible, it would be replaced by another in a few minutes. Half a dozen spare springs could be easily carried in the pocket, or two or three of the rings might be carried by each man if necessary.

When marching at ease, or when there is no immediate prospect of action of any kind, it might be desirable to relieve the man of the weight of the carbine altogether by attaching it temporarily to the saddle, with the power of resuming it again at a moment's notice; but this matter belongs more especially to the arrangements of the saddle, of which I shall now speak.

The military saddle, although modifications and improvements have been adopted, has remained much the same in its general construction since the time of the old Hussar saddle (*see* Plate IV.), with its fore and hind fork sideboards wolf, lacings, and pilch. We have lowered the front fork, modified the shape of the sideboards, substituted a fixed leather seat for the pilch, wallets for holsters, and screws and buckles generally for thongs and leather fastenings; but the saddle is still formed of two forks and two sideboards. Much has been done in the matter of the formation and padding of the latter in order to guard against the casualty of sore backs on service; even expanding and contracting forks have been invented in order to meet any alteration in the condition of the horse; but the great advantage of the old Hussar saddle was its simplicity, its repairability and strength, and we must not go into complication and expense, and the modified form of saddle we now have seems to answer its purpose; but we still have our cloak in front, and all our kit, with the exception of what goes into the wallets, in a valise, which

is strapped up to the hind fork with the ends partially resting on the prolongation of the sideboards. Here, I think, an alteration might be made with advantage.

If we were to suspend a saddle from the central point between the fore and hind forks, with the kit packed in the valise, we should find that the sideboards would make a considerable angle with the horizontal line; whereas if we pack the kit in saddle bags and attach them to iron loops before and behind the hind fork, the angle will be sensibly diminished; for when the whole of the kit is placed behind the hind fork, the weight acts with a kind of leverage, which throws up the front of the saddle. The inference to be deduced from this is, that when the kit is packed in saddle-bags the weight is brought nearer to the front and is more diffused over the whole surface of the sideboards, and therefore there is a more uniform and less partial pressure on the horse's back—and this, when the pressure is long continued, is a most important point. But we also gain what I conceive to be a more important point still, for we have not only brought the weight more forward, but we have also left the place behind the hind fork vacant, and we can therefore place the cloak there, and by this means leave the pommel of the saddle clear, so that the rider can get his hand as low upon his horse as he could with a hunting saddle. The great importance of this point will, I know, be appreciated by many. How many commanding officers would be glad to leave their capes and cloaks at home when their regiment turns out for an inspection, simply because they know the horses would move steadier without them? If this is the case, I think it points out most forcibly that the front of the saddle is not the place for the cloak.

Horses are now in our service broken carefully and systematically in the riding-school or open *manege*, and

during the bending and other lessons the man's hand is kept low upon his horse while riding with the stripped saddle, and with care and patience and skill the horse is by degrees accustomed to obey the indications of the bit and rein acting in a certain direction, approaching more or less to the horizontal line; but as soon as the horse joins the ranks and turns out in marching order, the whole affair is changed. The position which the man's bridle hand must necessarily assume in consequence of the placing of the cloak causes the rein to act in a different direction, and consequently the bit in the horse's mouth, at a different angle than that he was accustomed to when training in the riding school.

In order to appreciate the effect which this may produce, we must consider the following points:—

The unbroken horse naturally carries his head in the way most comfortable to himself, some higher, some lower, according to the bone and muscular formation of the animal. The head of the horse is, comparatively speaking, of a considerable weight; and if a continued strain upon the elevating muscles was involved in the retention of the head in what is commonly called the natural position, such a position would in time become fatiguing, if not painful, to the animal, and the head and neck would droop while in a state of rest. But nature has provided otherwise. A strong and elastic ligament is, in the first place, attached to the bone of the head, and at its origin is like a strong cord; it passes over the first bone or vertebræ of the neck next to the head, adhering to the second; it then spreads out, having different attachments, and is finally inserted into the spinous processes of the first dorsal vertebræ, otherwise the withers; and by this arrangement, when in a state of rest, the head hangs, supported by the withers, without any strain upon the elevating or depressing

muscles of the head and neck. In this position the horse retains his head without pain or inconvenience. As a general rule, I consider that horses, when treated with patience and temper, are inclined to be tractable, and after a little perseverance will be found ready and apt to obey the indications of the will of the rider given by hand or leg. Horses, therefore, still retaining the head in the position in which it was carried when the animal was in a wild state, or nearly so, may be ridden on the roads and in the field; and if the rider has a firm seat and a light hand, combined with a quick appreciation of the instincts and temper of the animal he is upon, wonders may be effected without further breaking or training, so much so that many people are inclined to think that the time, trouble, and training bestowed in the *manége* is unnecessary. When the horse's head and neck are in the position just described, if the indication of the hand communicated through the rein and bit, should be given strongly and forcibly, with a view to compel immediate obedience, although the horse may ultimately give way, the first result will be that a certain number of muscles will be brought into action to resist the force employed, and it will require a momentary exercise of the animal's instinct, or of the force of habit, to induce obedience. If the indication is given lightly and gently, which is the case when the rider has what is commonly considered a light hand, it takes a second or so before the horse is sensible of what the will of the rider is, although when he does know he is quite ready to obey. All this will do very well in many ordinary cases, when it matters very little whether your horse turns upon a radius of ten yards or one, or whether he can be stopped in his stride within twenty yards or five; but it will not do for finer work, when a man's success in action, and perhaps his own life,

depends upon the quick response to the indication of hand or leg. It has been often said, that nothing can exceed the quickness with which the Arabs, Indians, Circassians, and other nations, can turn their horses and check them suddenly, when required, in the *melée* or in their various games; also, that in pig-sticking, as it is called in India, the horse will turn and twist (if he is a good pig-sticker) in following the boar as suddenly and rapidly as the most elaborately-broken horse, and that without any of the fine training that we give in the *manege;* but I have analysed these matters, watched the games of the Arabs and others by the hour, had experience of well-trained pig-stickers, and have come to the conclusion that the animals do not follow the rapid indication of the hand, but their own animal instinct and habit. Horses know a great deal more than we generally give them credit for. The horses in the Arab games know that when their rider has been struck with the short club, that he is to follow the thrower in all his windings; that when he comes up to an opponent in the line, he is to circle closely round; that if his master puts his spear-point in the ground, he is to circle round it as closely as he can; that if the carpet is spread upon the ground, he is to keep an even, rapid pace, so as to enable his rider to calculate the proper moment for dropping the whip upon it. There are sympathies between the Arab and his horse that we Europeans have no conception of; besides which, the Arabs, Indians, &c., as a preliminary measure, tie down the horse's head by means of a scarf or other band, so as to draw it forcibly out of the natural position which I have been describing. The well-trained pig-sticker, when he has once got over his shyness and timidity, follows the boar because he knows that is what is to be done, and obeys his own instinct as much as the rider's indications in turning sharply to the right or left;

but this will not do for the nice work required in military riding, if the cavalry soldier is to possess the true and effective command of his weapons on horseback. For this we want the fine aids and quick response, which causes the cavalry man and his horse to be one, and makes the will of the rider and the action of the animal all but simultaneous; and now we will consider how this is to be had.

When the muscles and ligament which raise or support the head are relaxed, it requires a very slight muscular force to depress the head.

One of the principal agents in this action is a muscle extending from the breast, along the front part of the neck, not unlike in form and position to a standing martingale, becoming tendenous as it proceeds upwards to its insertion into the angle of the lower jawbone. The primary action of this muscle is to depress the lower jaw, and subsequently, if the action is continued, the whole head.

Other muscles assist in the depression of the horse's head; but it is chiefly necessary to consider the one just mentioned when speaking of the first training or breaking in of the horse. It is to induce the voluntary action of this muscle that the preliminary lessons in the breaking in of the horse, to be found in the "Training of Cavalry Remount Horses," by the late Captain Nolan; and also in Mons. Baucher's well-known work on the same subject (of which a new edition is just published), were constructed. It is to gain this first act of obedience that the first manipulation of the animal, both mounted and dismounted, is recommended. It seems, at first sight, a slight point to gain, but it involves a great deal; for, independent of the fact of the horse realizing that he may relieve himself by submission more quickly than by resistance, the head is placed in a position by means of which a medium is established which admits of the instantaneous communication

of the will of the rider to the horse, and all the muscles of the fore limbs are properly placed ready for responsive action; and when the training is complete, the indication of the will of the horseman, and the action of his horse, become almost simultaneous: in other words, the first approach to a proper feeling of the bit and reins is obtained. The mouth of the horse is surrounded by a sentient muscle, and even a slight pressure, on either one side or the other, becomes immediately apparent when the head is properly placed and the depressing muscle just spoken of is in action. The primary action of this muscle being upon the lower jaw, the latter, both from position and action, is ready to receive the slightest impression from the bit and rein.

In the system of training I have alluded to, what are commonly called the bending lessons follow the first lesson in the act of obedience, that is, the horse is trained to turn the head and neck upon a slight but steadily continued feeling of the bit and rein to one side or the other.

More than one muscle is brought into action in turning the horse's head: but the muscle we have now chiefly to consider is a muscle familiar to everyone, being the most conspicuous on the neck, and generally strongly developed in entire horses. Like most other muscles in the structure of the horse, these muscles are in pairs, one on each side of the neck; when one of these muscles act, the action is to draw the head on one side; but when they both work together, the action is to elevate or erect the head. It will therefore be obvious, that when the elevating action of both muscles is called into play, the lateral action of either cannot be immediate, and therefore, for this reason also, the position of the head and neck obtained in the first lessons is desirable.

Much more might be said in this matter, but I am not

going to write a treatise upon horse-breaking, and I have only pursued the subject so far to show why I consider the lowering of the man's hand on horseback, by the removal of the cloak from the pommel, so essentially important. Even a slight elevation of the hand above the position to which the horse was accustomed in training, causes a corresponding change of position of the horse's head, and also alters the action of the muscles just spoken of. The horse will either depress his head more, or else elevate it, to meet the new line of action of the rein. Depression beyond a certain point involves a continued strain of the depressing muscles, and an over relaxation of the elevating muscles, which is not comfortable to the horse, and to avoid the discomfort, he will resort to some habit that will render him less tractable than he was when he left the school; but the cloak and cape, even with every care to get it as low as possible, raises the man's hand, and, bringing the cloak too low in front of the fork, interferes with the circulation of air between the withers, the horse's back, and the saddle. If a continued feeling of the bit is kept up, the horse's head in many cases is raised beyond the natural position in which it hung suspended in a state of nature, by the ligament already described; this brings the elevating muscles into play, which is not only irritating and uncomfortable to the horse, but altogether prevents the immediate action of other muscles in answer to the indication of the bit and rein. The result is that the man gets into a way of riding with a loose rein, and loses the fine feeling of the horse's mouth, which insures instantaneous obedience. I know the answer to all this is, that men and horses have managed to work very well, and do good service with the cloaks and capes as they are, and that neither horse nor men have seemed to suffer inconvenience; and, as we shall most likely carry our

cloaks and capes as they are for many years to come, it is very satisfactory to think that it is so; but I cannot relinquish the conviction that the mounted swordsmen cannot be efficient, in the true sense of the word, unless he can command the instantaneous obedience of his horse, and have every muscle of the animal under his immediate control.

Besides the advantage obtained in lowering the man's hand upon his horse, another important advantage is gained by removing the cloak from the front part of the saddle, as the pommel is left free for the attachment of a small hook, by means of which, as already stated, when on the march the man can be relieved from the weight of his carbine by attaching it to the fore part of the saddle, with the power of detaching it again in a moment if required. Even without any further security than the hook, the carbine will ride quite safely, but a strap and single stud, which could be buttoned or unbuttoned in a moment, would prevent the possibility of its being displaced at any pace of the horse. When thus attached, the muzzle of the carbine projects very slightly to the side, and would not interfere with the next flank file when marching at ease by files or fours, and it would be detached from the saddle and attached to the belt in a second before forming up in line.

When the carbine is in action, this small hook can be employed for another useful purpose, namely, to attach a ring fastened to a small runner on the bit-reins, by means of which the reins draw in the proper direction, and the feeling of the bit in the horse's mouth is much the same as when the rider's hand is low and in the proper position; and if the horse has been trained to obey the fine aids given by the leg, he can be guided sufficiently for all practical purposes with the rein thus attached. A little

practice would make the horse obedient to this sort of guiding, and then both the rider's hands are free to use the carbine. I have myself been present when excellent practice has been made with the carbine on horseback on this principle (*see* Plate VIII.). What interferes with good practice on horseback at comparatively long range is, in the first place, the horse being in a state of excitement and anxiety to get back to the ranks which he has just quitted; secondly, the altered position of the bit in the horse's mouth if the reins are retained in the left hand while bringing the carbine to the "present"; thirdly, the unavoidable nervous action of the left hand and arm when the trigger is pulled, which is conveyed quite sensibly and in rather an unpleasant way to the horse's mouth through the medium of the bit and rein. The horse dreads this, and it makes him more or less nervous and unsteady just at the critical moment when every muscle should be at rest and the horse perfectly still to enable the rider to take a steady, deliberate aim. By this means I see no reason why very tolerable shooting should not be made from horseback with the improved arm with which the cavalry man is now furnished.*

I know the answer to this is that cavalry skirmishing has never been known to produce any results worth mentioning, and that therefore it never will; but if we give our men expensive firearms and train them to skirmishing, I think we may as well at least try to make them as effective as we can.

When the rein is attached as described, and the horse a little accustomed to work from the guiding of the legs, the cavalry skirmisher, if pursued, having his arms free, can fire to the right or left rear (*see* Plates V. and VI.),

* Remarks by Mr. Harran.

and thus probably dispose of one or perhaps more of his pursuers before they can close with him. The Arabs and other nations can guide their horses by the swaying of the body and other indications without the use of the rein, but the fine aid of the leg is surer and more certain when the horse has become accustomed to it. I should propose the flap of the saddle being shortened (*see* Plate IX.), which, besides being a small saving of expense, brings the man's leg in closer connection with the flanks of the horse, and if the men wear boots this would not be attended with the inconvenience caused by the coat of the horse attaching to the overalls.

The pommel being freed from the cloak, gives the opportunity of attaching a second hook to the near side, by means of which the sword can be got rid of in a second and attached to the saddle, leaving the right hand free to use the carbine. (*See* Plate V.) In this position the sword rides quite securely, the blade remaining between the man's left foot and the near side of the horse. The sword can be resumed in a second, upon the carbine being attached to the waist-belt and knee-spring, which, as has been already stated, is also a momentary action, the cavalry man can thus pass from one weapon to another in a moment, and that while his horse is at speed.

Every one must have more or less felt the difficulty and delay attendant upon returning the sword into the scabbard, even when the horse is standing still, and this difficulty is increased tenfold when the horse is at speed, or in action, and if to this is added the time occupied in bringing the carbine into action from any of the methods of attachment now extant, it may be said that the use of one or other of his weapons is interdicted to the cavalry soldier when pursued and in extremity, or on many other occasions when it might be desirable to pass rapidly from

one weapon to the other. Even drawing the sword as it is slung at present, is often attended with some difficulty and delay; for if the sword has turned upon the short carriage, so as to present the grip of the handle in the wrong direction, it has to be got round again before the sword can be drawn. To obviate this inconvenience, it has been proposed to put an additional ring in front of the top locket or upper band of the scabbard opposite to the ring of the short carriage, and by this means to attach the scabbard to the front of the waist-belt by a strap or small chain (*see* Plate III.). This contrivance retains the grip always handy for drawing the sword, and seems better than other contrivances which have been tried of carrying the sword in a frog fastening the scabbard by a strap round the left leg, &c.; but it is liable to the following objection. The sword is not in so convenient a position for carrying under the arm in the usual way, or in the hand when the man is dismounted, as when it is attached as at present by the short and long carriage. I should propose to get over this objection, as follows: I should attach a strap thong or chain to the front of the waist-belt, passing through the front ring of the top locket of the scabbard, again to the waist-belt by a stud, button or buckle. When the man is mounted, or about to mount, the strap thong or chain being then double, will be short enough to retain the grip of the sword in the proper position. When the man is dismounted, I should again simply detach the strap, thong or chain from the stud, button or buckle, by which means it becomes single and long enough to admit of the sword being carried in any position required. There should be a small stop at the end to prevent it running wholly through the ring.

Every thing in the shape of defensive armour, with the exception of the helmet, has been abandoned on account of

the weight and impediment to the free movement of the soldier in action; but if we can afford a little defence to the cavalry-man without imposing an undue weight or impeding free action, I don't see why we should not do so. I should therefore protect the leg by a small, light bar passing up inside the boot, the shoulders by light chains or scales, and the fore-arm by light bars inserted into the arms of the present pattern gauntlets; as to the helmit, the points to be considered are the fitting balance and properties of defence.

If we pass a band round the head, over the protuberances formed by th e frontal sinuses in front, and about an inch above the base of the occipital bone behind, and if we suppose this band to be about an inch broad behind, and gradually to diminish in breadth towards the front, till it becomes only half an inch broad over the frontal sinuses, this band will cover the proper points of contact of the helmet with the head. A perpendicular, about 6 inches in length, from the centre point of a horizontal line, passing through the centre of the skull from the point 1 inch above the base of the occipital bone, will give the height of the helmet, and the line of the spike or other ornament intended to support the plume. At the back the form of the helmet should follow the straight line for a short distance, both above and below the band just mentioned, thus gradually loosing contact with the skull, which, in most cases, recedes rapidly below and more gradually above. The back of the helmet should descend to the level of a horizontal line, which, if produced, would pass under the chin in front; this is necessary to defend the back of the head and neck from one of the most fatal cuts which can be delivered, and which, if not defended, might fracture the occipital bone at the base, or cut through the muscles of the neck and reach the spine.

If we should suppose a horizontal plane to divide the skull equally, that is, to pass, in most cases, through a point about 4 inches above the chin, and 4 inches below the top of the head. This, in my opinion, ought to give the lowest level to be reached by the edge of the peak; it is the fashion to admire straight peaks, the line of which follows the line of the front of the helmet, or nearly so; but on service a cavalry man has frequently other work for his eyes besides squinting at the front point of the peak of his helmet.

He may have to glance constantly round the horizon, in order to detect the first appearance of indications of various kinds, and he will find it a comfort if he can do this without poking out his chin and nearly dislocating his neck. There may be in this case a sacrifice of appearance to comfort and utility; but it has always seemed to me that nothing can look really soldier-like that is not service-like and comfortable to the wearer. I should propose, therefore, that the peak should project about an inch and a half or two inches from the front of the helmet. At the back, from the point about an inch above the base of the occipital bone, the helmet as it descends takes a slight curve outwards.

Of course, it is impossible the helmets should be fitted individually to each man, and fitting the helmet is a more difficult matter than would appear at first sight. The head takes as nearly as possible the form of the skull, and the human skull differs considerably in form and size in different individuals; and in hardly any one individual is the skull exactly the same at both sides. If the helmet is rounder than the head, there is an undue pressure upon the frontal muscle; and, if more oval than the head, on the temporal muscle. Any one who has worn a badly-fitting hat will know the pain that this sort of pressure gives; it

fortable when exposed to a tropical sun than a well-polished helmet.

ESTIMATE FOR THE PROPOSED PATTERN SADDLERY.

	£	s.	d.
Saddle complete, with two hooks, girth, leathers, irons and back plate, with screws	2	4	0
Two saddle-bags, with straps and horse-shoe cases	1	0	6
Wallet, with two straps	0	5	0
Three cloak straps	0	1	6
Two boot straps	0	1	0
Bridle, with Latchford's bit and V.R. bosses	0	6	0
Head collar, with link and tee bridoon	0	6	6
Sliding loop with steel ring and hook	0	2	0
Sheepskin, with leather seat straps and buckles	0	17	0
Surcingle	0	3	0
Collar chain	0	4	0
	6	0	6

COST OF PRESENT PATTERN SADDLERY.

Saddle complete	3	10	6¾
Valise and horse-shoe cases	0	15	5¼
Wallets (pairs) and straps	0	9	1¼
Bridle	0	7	2
Bridoon, head collar and chain	0	7	3
Sheepskin furniture	0	17	9
	6	7	3¼

PACKING OF THE KIT.

Wallet.

One horse brush.
Curry comb.

Stable bag.
Horse rubber.

Near Saddle-bag (with Shoe Case containing Turn Screw, Horse Picker, one pa[illegible] Shoes and Nails).

One sponge.
Two towels.

Two shirts.
One pair of drawers.
One flannel.

Off-side Saddle-bag (*with Shoe Case* containing Oil Tin, pair of Horse-shoes and Nails).

Off-side saddle-bag.	Set of blacking brushes.
Stable jacket.	Clothes brush.
Overalls.	Plume.
One pair of gloves.	Hair brush.
One holdall.	Brass Brush.

As to weight, it was found upon a careful comparison of the weights of the different articles, that the proposed equipment is about eleven pounds lighter than the present.

SIR,—In reply to your wish to know my ideas respecting helmets, I beg to offer the following remarks:—

1. The material should be polished metal, and I think brass preferable to steel, because it is more easily cleaned.

2. As to the principle of construction, it should be perfectly balanced when the head is in an upright position, and the lower the skull the better for use. I should prefer an ornament on the top, by way of finish, fashioned after the form of a spike, in preference to a crest, for its greater lightness and for its interfering less with the balance.

3. The peak should be no impediment to the sight or to ventilation. On this principle, it should project, and not come flat to the face. A projecting peak may be pointed, as the sight will not be affected by it.

4. The back of the head being the most difficult to guard against attack, it would appear reasonable that this part should be the best defended. It is not easy to say how this can be effectually done, but a considerable protection might be obtained by branches starting from the back peak and terminating on the upper part of the skull, quite detached from the helmet except at the extremities of the branches, which may be made ornamental.

5. The spike ornament at the top may be constructed to carry a plume. As, however, the higher the plume the more difficult it is to preserve the balance when the head is moved or the wind blows strong, the higher the plume the less it should be in bulk.

6. However correct the principle upon which the helmet may be

constructed in the first instance, its value may be entirely neutralised by its not being properly fitted to the head. To do this would be very expensive, as heads vary so much, not in size only, but in shape. I may say that I think no part of the helmet should touch the head below where the solid bone of the skull terminates.

I have the honour to be, Sir,

Your obedient, humble servant,

H. F. WHITE.

(Hawkes & Co.)

Remarks on the new Cavalry Equipment invented by Major-General Smith, C.B.:—

Saddle, Saddle Bags, &c.—I consider it of very great importance getting the bridle hand low, in its proper place, by removing the cloak and cape from the front to the back of the saddle. The use of saddle-bags, I consider, too, is preferable to a valise, which is placed across the horse's loins where he is least able to bear weight, whereas the weight of the saddle-bags come more upon the centre of the back. Wallets, I think, might be added to the front of the saddle, to carry the same portion of the kit that is at present carried in them, as it would equalise the weight without raising the bridle hand. The present system of carrying the cloak and cape cannot, I consider, be too much condemned, as it causes a most unnatural pull upon the horse's mouth by raising the bridle hand far above its usual position.

The Bit, Headstall, and Reins, are, I consider, much simplified and improved.

The Crupper, I consider, might be dispensed with altogether with advantage, as it is of no use and interferes very much with the saddling, besides being a fruitful source of sore backs, by pulling the saddle back to put the crupper under the tail, and then pushing it into its place against the grain of the horse's coat. This not unfrequently occurs in hurried or careless saddling, especially by night.

The System of Carrying the Carbine is open to fewer objections than any other system with which I am acquainted. It certainly enables a man to get at his carbine very readily, and to mount and dismount with it without any difficulty; so that a dragoon, when

dismounted, would not be separated from his arms, which is one of the greatest objections to the present system of attaching the carbine to the horse instead of the man, by which many very serious mishaps have occurred to the dragoon on service, through his horse being shot, or through his being dismounted in a *melée*, and losing his carbine with his horse in consequence. With this system, the dragoon, when on the march or when fatigued, can attach it to the front of the saddle by a hook for the purpose.

The System of Attaching the Sword to a hook on the front of the saddle would prove very convenient when skirmishing, and would enable the dragoon to go from one arm to the other with the greatest rapidity, which I have myself witnessed with a man on the first trial.

The System of Attaching the Reins to a Hook on the front of the saddle while firing ball, I have tried with several horses, and have always found to answer perfectly. It enables a man to let go his reins altogether, and to use both hands to his carbine, the same as when dismounted. With this contrivance, the men made very accurate shooting at 200 yards at a target, making over 30 points each in 10 rounds.

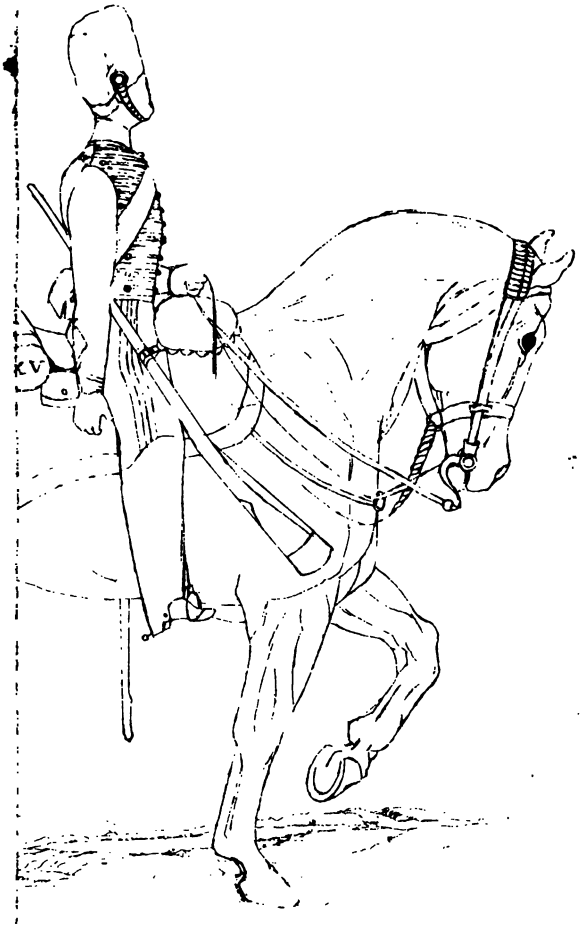
It is over 12 months since I saw this Equipment, so that I cannot recollect distinctly all the peculiar features in it, but one of the things that I liked best was the getting rid of the cloak from the front of the saddle, by which means the bridle hand assumes its natural position, and I don't think it is possible to attach too much importance to this.

G. Harran, *Lieut., 4th Dragoon Guards.*

Weedon, May 10, 1869.

W. Mitchell & Co., Printers, 39, Charing Cross, Westminster, S.W.

Pl. II.



is, therefore, by no means an easy matter to make a generally fitting helmet. Mr. White has kindly assisted me with his experience in the construction of helmets, and his remarks on this subject will be found attached.

We have placed most of the ornaments of our helmet in front, and this is to a certain extent a defence, for it at least doubles the plate of metal; but at the back, where the contact between the helmet and the skull is the closest and most considerable, we have nothing but the single plate of metal of which the helmet is composed. In some helmets a bar passes inside the helmet from front to rear; if the cut was delivered so as to strike exactly the centre of the back of the head, the bar certainly might prevent the penetration of the edge, but the shock would be so great that it might produce concussion, as the bar as well as the metal of the helmet is in actual contact with the skull; in the event of the direction of the cut being lateral, the bar would not prevent the penetration of the edge. I should propose two slightly curved bars of metal, at each side of the back of the helmet, the extremities of which should be attached to points above and below the contact of the plate of the helmet with the skull. These bars might be made ornamental, and would not interfere with the general form and appearance of the helmet; and the force of a cut falling upon points which were not in actual contact with the skull, the shock would be greatly diminished, and the penetration of the edge impossible if the bars were strong enough to resist it; and, as we have the principal part of our ornaments in front, the balance of the helmet would not be destroyed by this slight addition at the back.

I shall finish these remarks by saying that experience has taught me, as it has many others, that it is a mistake to abandon our helmets in India, or other hot climates, and to adopt the substitutes generally imposed upon the soldier. In my opinion there is no head-dress more com-

fortable when exposed to a tropical sun than a well-polished helmet.

ESTIMATE FOR THE PROPOSED PATTERN SADDLERY.

	£	s.	d.
Saddle complete, with two hooks, girth, leathers, irons and back plate, with screws	2	4	0
Two saddle-bags, with straps and horse-shoe cases	1	0	6
Wallet, with two straps	0	5	0
Three cloak straps	0	1	6
Two boot straps	0	1	0
Bridle, with Latchford's bit and V.R. bosses	0	6	0
Head collar, with link and tee bridoon	0	6	6
Sliding loop with steel ring and hook	0	2	0
Sheepskin, with leather seat straps and buckles	0	17	0
Surcingle	0	3	0
Collar chain	0	4	0
	6	0	6

COST OF PRESENT PATTERN SADDLERY.

Saddle complete	3	10	6¾
Valise and horse-shoe cases	0	15	5¼
Wallets (pairs) and straps	0	9	1¼
Bridle	0	7	2
Bridoon, head collar and chain	0	7	3
Sheepskin furniture	0	17	9
	6	7	3¼

PACKING OF THE KIT.

Wallet.

One horse brush.
Curry comb.
Stable bag.
Horse rubber.

Near Saddle-bag (*with Shoe Case* containing Turn Screw, Horse Picker, one pair of Shoes and Nails).

One sponge.
Two towels.
Brass ball.
Two pairs of socks.
Two shirts.
One pair of drawers.
One flannel.